AN ABSTRACT OF THE THESIS OF

David Stepp for the degree of Master of Arts in Interdisciplinary Studies in the co-departments of Anthropology, Zoology, and Statistics presented on February 2, 1994.

Title : Descriptive Analysis of Human Remains from the Fuller and Fanning Mounds, Yamhill River, Willamette Valley, Oregon

Abstract Approved : Redacted for Privacy

Roberta Hall

The study presents the results of a descriptive analysis of the skeletal remains of 66 individuals recovered from the Fuller and Fanning Mound sites, located on the Yamhill River, Willamette Valley, Oregon, excavated in 1941-42 by W. T. Edmundson and William S. Laughlin. The literature and original field notes have been analyzed, and a description of burial type, side, orientation, grave type, associations, original preservation, and other information has been compiled for each individual. A tally of each of these burial attributes for the Yamhill population as a whole is also completed. In addition, an assessment of age, sex, and stature, a series of craniometric measurements, and non-metric traits, a dental analysis, and general description of obvious pathologic and morphologic condition of each individual and the group as a whole have been accomplished.

Differences in trade item associations between deformed and non-deformed individuals suggest either a later arrival of cranial deformation practices (and possibly another cultural group) to the area, and possibly a multiple occupation of the Fuller and Fanning sites, or an elite class separation defined in part by artificial deformation of crania. Cranial deformation is also associated with the frequency of certain cranial discrete traits. Sexual dimorphism was noted in

metric but not in non-metric analyses. Stature estimates indicate a population with mean stature of 1636-1661 for males, and 1547-1574 for females, typical among prehistoric Oregon populations. Mortality appears high for infants and adolescents when compared with other prehistoric North American samples. Dental attrition and caries may indicate a heavier reliance on plant than on animal foods. Single trait comparison to other regional populations shows some significant differences and indicates a need for further analysis of biological relationships using larger comparative samples and multivariate statistics.

Descriptive Analysis of Human Remains from the Fuller and Fanning Mounds, Yamhill River, Willamette Valley, Oregon

by

David Stepp

A THESIS
submitted to
Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Arts in Interdisciplinary Studies

Completed February 2, 1994
Commencement June 1994

APPROVED :

Redacted for Privacy

Professor of Anthropology in charge of major

Redacted for Privacy

Professor of Zoology in charge of co-field

Redacted for Privacy

Professor of Statistics in charge of co-field

Redacted for Privacy

Chairman of Department of Anthropology

Redacted for Privacy

Dean of Graduate School

Date thesis is presented February 2, 1994

Typed by David Stepp

Acknowledgements

I would like to thank Dr.William S. Laughlin for his help in deciphering some of the data and in confirming some of the history of excavation of the Fuller and Fanning sites. Thanks also to Dr. Don Dumond for allowing study of the remains held at the Oregon State Museum of Anthropology, and especially Pam Endzweig and other museum staff who readied the collection and field notes for my analysis. I am deeply indebted to Dr. Roberta Hall, who never fails to provide guidance, patience and time, whenever asked. And, thanks for the long hours in editorial review. Thanks to my committee members for their support and help : Roberta Hall. Fred Ramsey, John Ruben and Lisa Sarasohn. The Boas' data has been made available through Roberta Hall, courtesy of Richard Jantz, University of Tennessee. Chester Schmidt has provided advice and support in the computer processing and printing of the thesis as well as friendship and discussion of ideas. Thank you. Most of all, thanks and love to Pam and Lena who have interrupted the past several years in a most delightful fashion.

My thesis and education are dedicated to my always supportive mother, Mrs. June Fankhauser, and my grandmother, Mrs. Clara Berman, whom I may have surpassed in schoolin' but never in knowledge.

Table of Contents

List of Figures

List of Tables

Descriptive Analysis of Human Remains from the Fuller and Fanning Mound, Yamhill River, Willamette Valley, Oregon

Chapter 1
Introduction

History of Archaeological Research Involving Fuller and Fanning Mounds

Systematic archaeological investigation of prehistoric midden sites in the Willamette Valley, Oregon was begun in 1928 by Blevins, Slate, and Brock who located 88 middens along the Calapooia River, with an additional 37 middens located by Margason along Muddy Creek (reported in Collins 1951). In 1933 Cressman, Berreman, and Stafford in the Long Tom River area near Franklin, Oregon located 14 middens (Collins 1951). Cressman excavated two of these sites (the Virgin Ranch and Smith-field sites), but found little in the way of human remains - one infant burial was recovered from the Smith-field deposit (Collins 1951). In 1941 Cressman along with William S. Laughlin reported on a problematic association of human artifacts and mammoth remains near Lebanon, Oregon (Cressman and Laughlin 1941).

In 1941, under the sponsorship of the Willamette University Department of Anthropology and Museum, William S. Laughlin directed excavations at four midden sites including the Spurland and Miller Mound Sites near Harrisburg, Oregon and along the Little Muddy Creek. Also excavated was the Halsey Mound and the Shedd Mounds along the Calapooia River (Laughlin 1941). Five skeletons and fragments of a sixth were recovered from the Spurland Mound, three from the Miller Mound (by a collector - not Laughlin), two from Halsey Mound, and one skull from the Shedd mounds (Laughlin 1941).

The Fuller and Fanning Mound sites were located by Dr. W. T. Edmundson (a medical doctor from Newberg, Oregon) while surveying along the Yamhill River in 1941 (Laughlin 1943). Fanning Mound was excavated in the spring and Fall of 1941 by Edmundson with

primary assistance from Mark Wald, of Portland, Oregon and Laughlin (Laughlin 1943, 1992 pers. comm.). The Fuller Mound was excavated by Edmundson during parts of 1941 and 1942, again assisted by Wald and Laughlin (Laughlin 1943, 1992 pers. comm.).

Laughlin described the Fuller Mound in 1943 (Laughlin 1943):

> "The Fuller Mound is approximately three miles west of Whiteson, and one-quarter of a mile south of the present course of the Yamhill River, on the farm of Mr. G. C. Fuller. To the west of the mound is a large oxbow depression. This remnant of the former stream bed has been partially filled by aggradation of the western portion of the mound. The mound is 39 m. long, 24 m. wide, and 100-150 cm. in depth in the central area. The entire surface of the site has been cultivated. It has no well defined form, but the long axis appears to have been north and south.
>
> Of the two mounds excavated, the Fuller mound yielded fewer artifacts, and contained less fractured rock in the mound mass. Yet the Fuller site contained more artifacts than the Calapuya River mounds previously excavated and produced more broken bones, especially those of deer and elk. Fox, beaver, bird bones, and fish vertebrae were also present. Dissociated and fragmentary human skeletons were found at different places in the mound deposit. One fragment of a burned human skull was found. All the usual characteristics of the local valley mounds were present; fire hearths, bone, ash, chips and rock fragments distributed throughout."

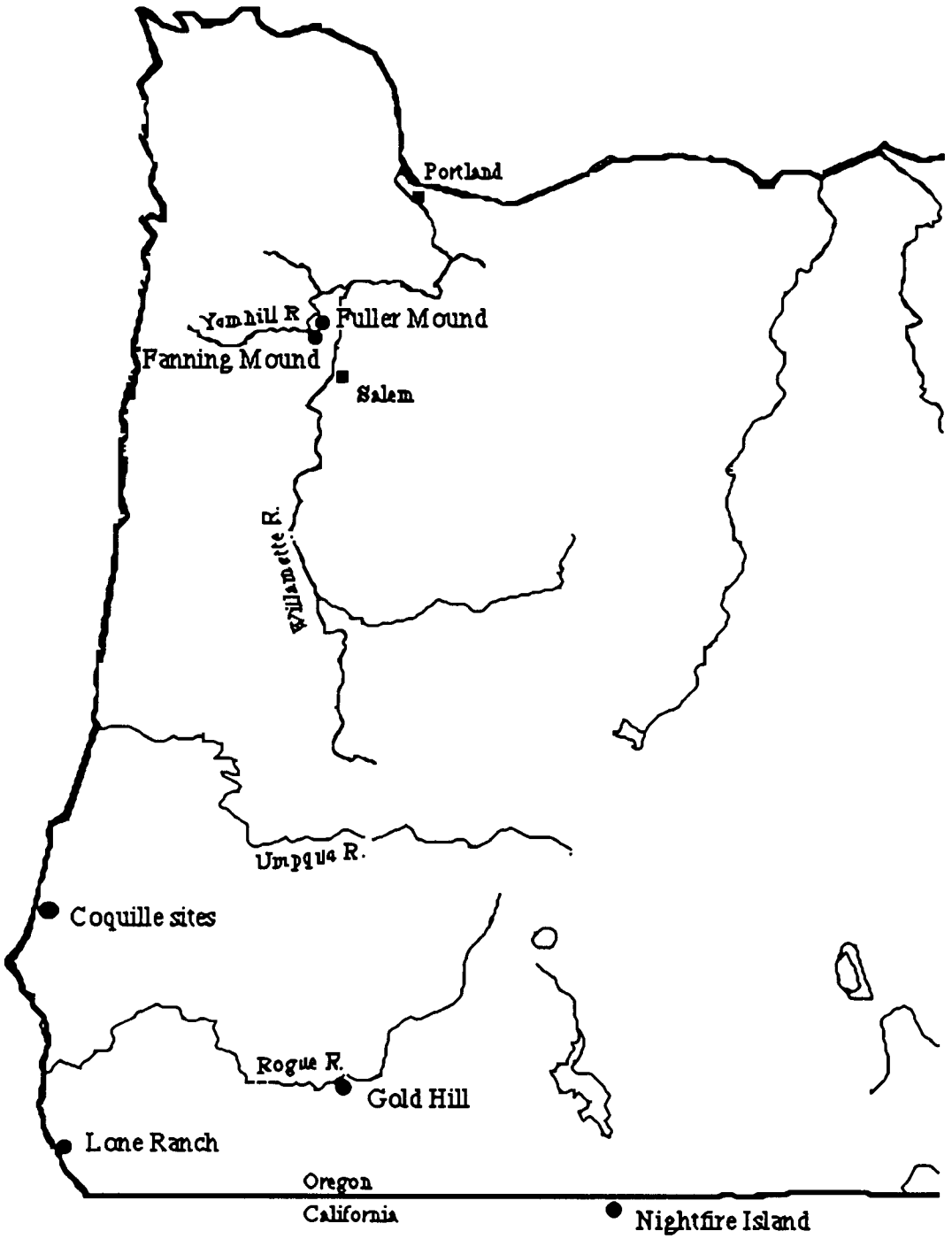

Figure 1. Location of Fuller and Fanning Mounds, and other sites with skeletal populations discussed in text (western Oregon).

and the Fanning Mound in the same report:

> "Six miles up the Yamhill River beyond the Fuller mound is a larger and even richer site on the farm of Mr. B. G. Fanning. This site is 61 m. long, 38 m. wide, 150 cm. in depth in the central area, and lies with the long axis northeast and southwest. It is situated on a terrace about one hundred yards from the present course of the Yamhill River. During wet seasons the low area between the river and the terrace upon which the mound is built is flooded. On one-half of the mound are large maple trees from three to seven feet in diameter, the other half is a part of a wheat field. The deposit of this site is darker, of finer texture and screens more easily than that of the Fuller site. In general there were more arrow points and more ground stonework."

Laughlin (1943) further described some of the more complete or interesting burials from both sites reporting information on type of burial, side, orientation, associated artifacts, sex, age, presence of artificial head deformation, and occasionally information on burial matrix. The information was not complete for each individual burial. The only osteometric analysis reported was a cranial index recorded for about half of the individuals listed in his report (Laughlin 1943). Further osteometric analysis was recorded in the field notes (Edmundson and Laughlin 1941-42). Laughlin's recorded information on the burials is presented in the burial descriptions (Table 19, Appendix A).

Laughlin's (1943) description of artifacts from the sites was less elaborate than for the burials. He described and illustrated several of the interesting artifacts associated with the various burials as well as some of the other artifacts. Projectile points were classified into types, but no real discussion of lithic technologies was discussed. Other artifacts were not systematically classified. It is likely that much of the artifact assemblage from the site was not

collected - i. e. it was often the case in the time period of excavation that broken tools and most if not all of the lithic debitage would have been discarded in the field.

Subsequent to Laughlin's report (1943), Lloyd Collins (1951) presented a summary of knowledge on the Kalapuya Indian people and included a descriptive listing of burial information and artifact descriptions and illustrations from Willamette Valley sites including both Fuller and Fanning Mounds. Collins' information on the burials was for the most part taken directly from the field notes. Interestingly, some discrepancies are found upon comparing Collins' and Laughlin's descriptions of the burials. Collins' information on the burials is presented in the burial descriptions (Table 19, Appendix A).

The field notes contain most of the information reported in both Laughlin and Collins (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951). Laughlin, having more direct knowledge of the excavations, has probably presented a more accurate picture of the burials and artifacts, although Collins includes some information that Laughlin chose not to discuss. Specific information found in the field notes and regarding the individual burials is presented in the burial descriptions (Table 19, Appendix A).

In the 1975 publication, *Archaeological Studies in the Willamette Valley, Oregon* (Aikens ed. 1975), Murdy and Wentz (1975:350-374) systematically classified and described artifacts from the Fanning Mound, while Woodward, Murdy, and Young (1975:376-402) systematically classified and described artifacts from the Fuller Mound. These works provided a more detailed, systematic, and descriptive morphological analysis of the artifact assemblages from both sites. The analyses fell short, however, of describing the technological attributes of the artifacts - more work is needed in this area.

The human remains from the Fuller and Fanning Sites have rested at the Oregon State Museum of Anthropology, University of Oregon, Eugene, Oregon for the last fifty years with no further study prior to the current project presented here.

The Study of the Fuller and Fanning Skeletal Samples

The human remains from the Fuller and Fanning Mounds represent the largest well-defined (in time and space) skeletal population of prehistoric peoples from the Willamette Valley, and possibly in Oregon. To date, however, it has received little in the way of study. The current project provides a basic descriptive analysis of that population - the first necessary step in the study of any skeletal group. The remains are catalogued and held at the Oregon State Museum of Anthropology (OSMA) on the campus of the University of Oregon, Eugene.

Burial information for each individual was not well-recorded by the excavators, but some information was reported in the field notes (Edmundson and Laughlin 1941-42), by Laughlin (1943), and by Collins (1951). This information will be presented and summarized, and I will also attempt to interpret some of the inconsistencies between these previous records.

Second, an enumeration of skeletal components and their condition will be made for each individual. This includes presence or absence of bones, condition of bone (whole or fragmentary), general morphology of the bone (appearance, shape, ruggedness etc.), and any obvious pathology or anomaly present. Dentition will be recorded for all of the above as well as an estimate of attrition level for each tooth.

A traditional series of measurements will be applied to the crania, innominates, and femora. These will be utilized in univariate analysis of the population as a whole, in comparison between the two site sub-populations (i.e. Fuller vs. Fanning), comparison to other populations (see section on other Oregon skeletal populations), and comparison between males and females. Stature estimates of individuals will be determined from femoral lengths utilizing various formulae.

The crania will also be examined for a series of non-metric traits. Analysis includes description of the population, comparison between the two sub-populations, comparison to other populations, and comparison between males and females.

Demographic structure of the population will be constructed utilizing sex estimates and probable age at death for each individual. Sex estimates will be made from cranial morphology, pelvic morphology, and measurement of the femoral head diameter. Age at death will be determined from dental eruption sequence, state of epiphyseal union, cranial suture closure, and age related changes in the pubic symphysis. Other clues to age and sex may also be used.

Organization of Report

The thesis contains several sections, the goal of which is to present a profile of the human remains collected from the Fuller and Fanning Mound sites with regard to their basic description and the context from which they emerge. Some attempt is made at further detail and analysis of the population alone and in comparison with other Oregon skeletal populations.

Initial sections outline an ethnographic and linguistic sketch of the Kalapuya, followed by a cursory look at Willamette Valley prehistory. The prehistory section includes an overview of the environment and cultural ecology of the area, previous archaeological study in the valley, and a discussion of archaeological study at the Fuller and Fanning Mounds. Next, an overview of other skeletal populations known from the region is presented. This overview includes information from the major osteological collections discovered in the region as well as Franz Boas' anthropometric data based on measurements of a sample of Kalapuya descendents in the 1890's.

Methodology used in study of the current population is presented. Method of burial description, morphological description, osteometric technique, non-metric trait assessment, dental analyses, sex, age and stature estimates, and statistical analyses are described.

Results of analyses for each individual are presented in a database and text format (Table 19, Appendix A). For each individual a listing of known information including burial descriptions and other items (mostly from previous researchers Edmundson, Laughlin and

Collins), plus age, sex, and stature estimates, are presented in a data base format followed by a written description of the individual remains and analyses. Tabulation of osteometric and non-metric analyses are done for the group as a whole, in several tables (Appendix C and in text). Comparative analyses are also presented in tabular form.

A discussion of the findings follows the results section. Discussion will focus on general description of the remains, sex and age demo graphics, stature estimates, cranial and post-cranial metrics, cranial non-metrics, dental analyses, pathology, and comparative studies. Finally, there is a summary section including suggestions for further research.

Terminology and Problems

Spellings of the term "Kalapuya" are many. The word in its various forms often has different meaning as well as different historical origin. Kalapuya, here, is a general term referring to the Penutian speaking people that occupied the Willamette Valley at the time of European contact. These people may have belonged to any of several local groups (see the ethnographic section of this report). Other spellings of the word are occasionally used, for example: Calapooia, referring to the river of that name, and Callapooya, the tribal spelling from Franz Boas. In the general text, for all ethnographic or linguistic terminology, a most commonly accepted spelling, Kalapuya, is utilized. Occasionally, an alternate spelling is used when appropriate for historic or geographic reference.

Osteometric and anatomic terminology adhere to that utilized in standard osteological texts (see Bass 1981, Brothwell 1981, Shipman et. al. 1985). Osteometric measurements are the same as those found in Olivier (1969), but are defined here for clarity (see Appendix B). Non-metric traits are found in Berry and Berry (1967), and are also defined here (Appendix B).

In the original research on the human remains from Fuller and Fanning mounds, Edmundson and Laughlin apparently assigned burial numbers (e.g. Fuller #10) to remains found

in a single grave, with some attempt at distinguishing individuals. Field notes for the excavation, however, are scant and give little clue to specific methodology and almost no clue to true provenience of any individual (although non-specific locations and sketches are sometimes provided). At some point in time the Oregon State Museum of Anthropology (OSMA) assigned accession numbers to each individual (e.g. Fuller #10 was assigned OSMA #11-162). The museum tried to label each element (whole or fragmentary) of each individual with the accession number. As it turns out there was occasionally more than a single individual associated with a single burial number. For example, Fanning #14, 11-198, has three individuals marked with these numbers, including an adolescent, an adult, and a young child. In these cases the present research adds a letter designator to both numbers, i.e. Fanning #14a, #14b, #14c, and 11-198a, 11-198b, 11-198c. Number of individuals was apparently not always determined for each burial. Also, it would be convenient to assume that these three individuals were buried in the same grave, but this is not indicated in the excavation field notes and so cannot be supported. In addition, several burial numbers and the associated remains are apparently missing (e.g. Fuller #1). These remains are not at the OSMA and have no assigned accession numbers. Laughlin (personal communication 1993) did not know the current location of these remains. Information on these burials given here is simply a reiteration of what has been previously reported in Edmundson and Laughlin (1941-42), Laughlin (1943), and Collins (1951). Inconsistencies in information on the various burials exist between what is stated in the field notes (Edmundson and Laughlin 1941-42), Laughlin (1943), and Collins (1951). Data from all three sources is reiterated here and some attempt at reconciliation is made. Further discussion of problems associated with individual burials and the numbers assigned to them is given within the descriptive text for each specific burial (refer to the burial descriptions in Table 19, Appendix A).

Reference to the "field notes" of the excavations mentioned throughout the report actually include a series of notes, correspondence, measurements, and records held at the

OSMA under accession number 88. These notes et. al. were written by Edmundson, who wrote regular letters to Laughlin for each day's excavation at the sites, and by Laughlin who kept other notes and took osteometric measurements. There are also a few pages of general record keeping written or compiled by others (probably museum workers).

Chapter 2
Linguistic and Ethnographic Outline of the Willamette Valley

Systematic investigation into the linguistic and ethnographic relationships of the peoples occupying the Willamette Valley was initiated by George Gibbs (Kinkade 1990, Zenk 1990) on the Yamhill Kalapuya. Philologist Albert Gatschet, beginning in 1877, worked with the Tualatin Kalapuya in the Willamette Valley, collecting linguistic and ethnographic material - this material being reported in Hodge (1907, 1910) and extensively in Jacobs et. al. (1945). Following Gatschet, Leo Frachtenberg worked with the Kalapuya between 1909 and 1917. Again, most work was with a few surviving Tualatin, although at least one Yamhill myth survives (albeit with a Tualatin translation, see Jacobs et al. 1945). Melville Jacobs building on the work of both Gatschet and Frachtenberg gathered further linguistic information on the Kalapuya including some Tualatin, Yoncalla, and Santiam myths and ethnographic texts (Jacobs 1937, 1962, Jacobs et. al. 1945, Zenk 1990). Prior to these researchers only anecdotal information had been recorded, especially by early explorers, missionaries, settlers, and naturalists (see for example Parker 1838, in Kinkade 1990; Brackenridge 1841, in Sperling 1931; and Douglas 1959).

Linguistic Research

Kinkade (1990) has adequately described the history of linguistic research for northwest coast cultures. Kalapuyan languages, based for the most part on original research by those listed above, have been placed variously in their own family (Powell 1891, in Kinkade 1990), in their own family but within the Penutian phylum (Sapir 1929, in Kinkade 1990), and more recently as a subfamily of the Takelman family, within a Penutian phylum (Kinkade 1990,Table 1, pg 104; Thompson and Kinkade 1990, Table 1, pp 34-5). These classifications suggest close relationship with the Takelma Indians occupying lands to the south in the Rogue

and Umpqua River drainages. Other closely related groups living in the surrounding areas and speaking languages classified as Penutian include the Alsea, Siuslaw, and Coos coastal groups to the west, the Molalla in the Cascade foothills to the east, and the Chinookan speaking groups along the Lower Columbia to the north.

The Kalapuyan sub-family is further divided into three languages including Tualatin-Yamhill in the north, Central Kalapuyan in the mid-Willamette Valley, and Yoncalla south of Eugene, Oregon. (Thompson and Kinkade 1990). These were appare ntly spoken in one to several dialects depending on the number of groups of speakers in the respective areas (Frachtenberg 1918; Jacobs et. al. 1945; Thompson and Kinkade 1990). All three languages were extinct by the mid-twentieth century. Thompson and Kinkade (1990) suggest a very early (several thousand years) in-place development of the Kalapuyan languages from early Proto-Penutian speakers. Other Penutian speaking groups would have emigrated from a lower Willamette Valley homeland to surrounding areas (e.g. Alsea, Coos, Siuslaw, Chinook etc.), or moved farther afield (e.g. the Tsimshian of British Columbia). Linguistically, then, the Kalapuya have been in the Willamette Valley for a very long time.

Ethnographic Research

The work of Gatschet (in Hodge 1907, 1910; Jacobs 1945), Frachtenberg (1918; Jacobs 1945), and Jacobs (1945, 1962) provides modest ethnographic information on the various Kalapuya groups. There were at least seven but possibly as many as thirteen distinct (both ethnographically and linguistically) Kalapuyan groups (Figure 2) within the valley including the Tualatin (Atfalati), Yamhill, Pudding River (Ahantchuyuk), Luckiamute, Santiam, Mary's River, Tsankupi, Muddy Creek (Chemapho), Long Tom (Chelamela), Chafan (Tsanchifin), Mohawk, Winefelly, and Yoncalla (Hodge 1907, 1910; Jacobs 1945; Collins 1951; Minor et.al. 1980; Zenk 1990; Aikens 1993).

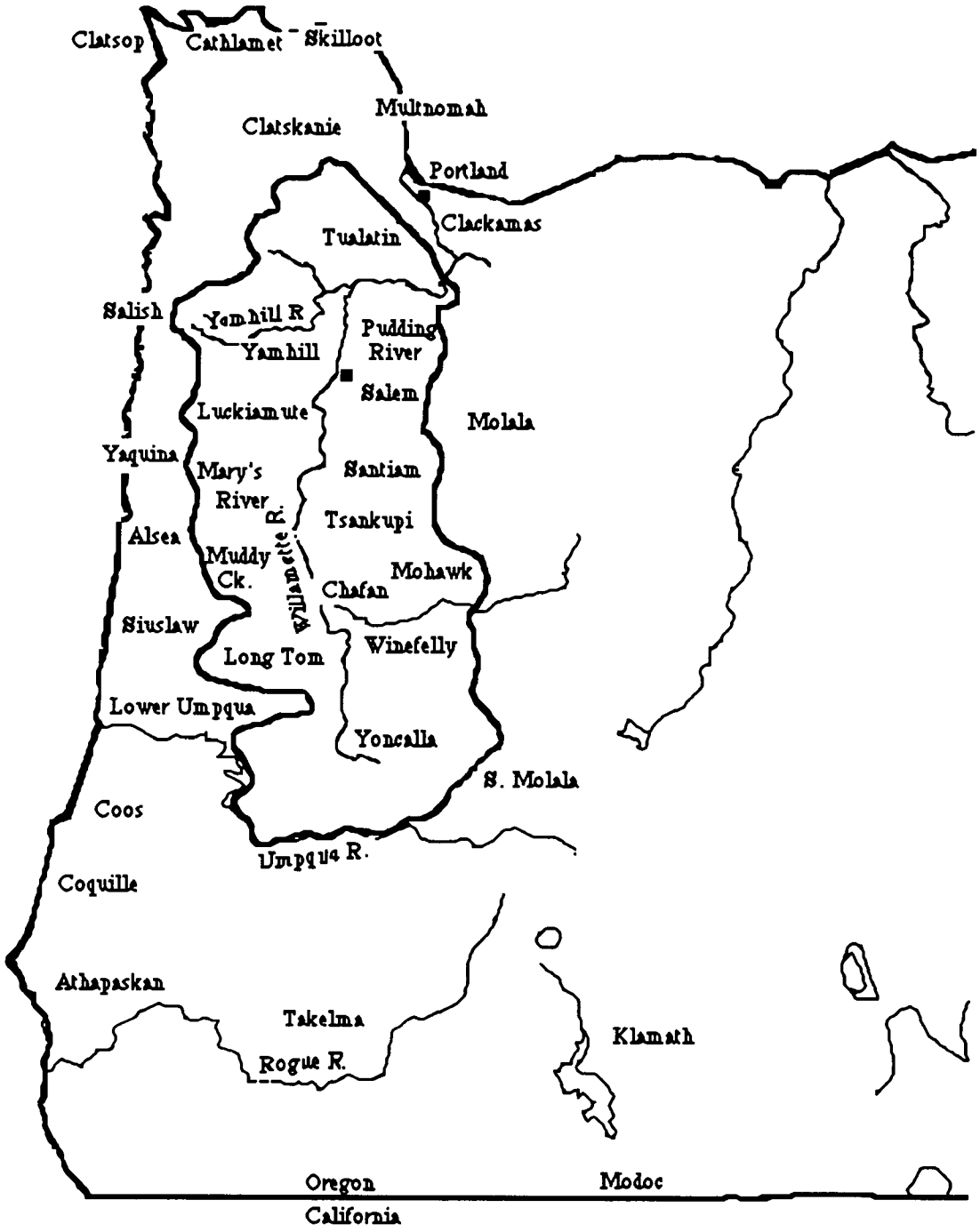

Figure 2. Kalapuya ethno-linguistic distribution, and surrounding native groups in western Oregon.

Territory and Political Organization

The Kalapuya as a whole were an inland people whose territory was defined by most of the upper Willamette Valley (above Willamette Falls at Oregon City) and a small portion of the upper Umpqua River drainage. Each Kalapuya group lived as an autonomous tribe within their own territory - possibly better defined not as territory, but as occupation of a sub-basin within which the group had access to its own set of floral, faunal and other resources. Within each sub-basin a tribe may occupy several villages all having access to resource and hunting areas, but each village may have had its own plant harvest areas, which may have been further divided into individual gardens or plots.

The local village consisted of one or more extended families with highest authority vested in an immutably wealthy person(s) or "chief(s)". The literature also suggests that each greater tribal area was headed by a chief (Gatschet in Hodge 1907, 1910; Zenk 1990). Chieftainship was not necessarily hereditary but passed with wealth - usually from father to son, although women were not unheard of as leaders (Hodge 1907, 1910; Zenk 1976, Minor et. al. 1980). The village chief was responsible for resolution of disputes within the village, while the tribal chief was responsible for treaties (Zenk 1990), although Zenk notes that tribal chieftainship may have been an historical development of dealings with the American government.

Social and Religious Life

Societies were divided into the wealthy (chiefs and families), a graded middle class, and slaves. The keeping of slaves may have been more common among the northern groups than the southern, possibly influenced by the Chinookan people along the Columbia River and lower Willamette who also practiced slavery (Zenk 1990). It is noted that the central and southern Kalapuya may have been the victim more often than the keeper of slaves (Zenk 1990).

The wealthy man was polygynous if he preferred, the marriage transaction resulting in payment to both families (see especially Jacobs et. al. 1945 for texts regarding marriage rituals). Religious life focused on Shamans, individual guardian-spirit guides, and mythologies associated with any number of natural entities. Collins (1951) provides a list of animal characters and respective personality traits. Jacobs et. al. (1945) in their "Kalapuya Texts" relate many mythologic associations with natural phenomena, and both animal and plant life.

Decoration of apparel and the body reflected social status. Worn or displayed items may include shells of *Dentalium*, *Littorina*, and Abalone, bone beads or carvings, glass trade beads, porcupine quills, and feathers; items often attached to the clothing, necks, arms, wrists, legs, ankles, or worn in ears and noses. Tattooing varied from locality to locality but was found on the faces ,arms and legs of both men and women. Cranial deformation (in this case - fronto-occipital head flattening) also was practiced by the Tualatins, less often by the central valley tribes. Again, the northern Kalapuya Tualatins probably were more influenced by the Chinookan cultures immediately to the north, for whom this type of head flattening is named (i.e. the "Chinookan" type of flathead), while the southern Kalapuya were less influenced.

The dead were typically buried although cremation was occasionally practiced. Cremation may have been preferred if there was fear of coyotes or wolves disturbing the remains (Jacobs et. al. 1945). Material belongings were usually "killed" (i.e. broken or otherwise rendered useless) and buried with the wealthy owner. These items may have included ceremonial clothing, baskets, groundstone, stone tools, numerous beads of shell and bone, and ornamental pieces (Laughlin 1941, 1943; Jacobs et. al. 1945; Collins 1951,). Wealth, including property, material goods and slaves, of the individual would then be distributed to relatives or sometimes non-relatives (Jacobs et. al. 1945). The poor would be buried without grave goods or fine clothing (Jacobs et. al. 1945). Jacobs et. al. (1945) describes the burial of a man and woman:

> "the Tualatin Indians, when (some) one man died he was buried, he was dressed in quantities of money beads. One horse would be killed. They would wait one day, (if) his sons were away, (then) they got back. They dressed up (the body), they wrapped it in ten blankets. They put numbers of baskets (and wooden buckets - - with holes punched in their bottoms) on sticks, they made a wooden fence, they buried him, they went back home.
>
> They dug a hole, and then they put her into it, and they buried her. Now then they stood up sticks, and they hung baskets on them (at the grave). Always at the cemetery, they always hung buckets around all over the graveyard."

Jacobs et. al. (1945) further describes the ritual cleansing by smoke, and occasional destruction by fire of the deceased person's house, the methods of mourning a spouse, and briefly mentions the land of the dead in one myth. The single horse killed was for use by the deceased in the land of the dead - interestingly the Kalapuya did not have horses until after contact with Europeans, an obvious change in cultural practice brought on by Euro-American contact.

Settlement, Technology, and Subsistence

The Kalapuya inhabited permanent villages during the wet, cold season but ranged in itinerant camps during the rest of the year (from April or May to November) (Gatschet in Zenk 1990). Winter houses typically consisted of semi-subterranean, rectangular structures with bark or plank siding on a pole framework (Mackey 1974, Minor et. al. 1980). The village would have also contained sweathouses of sticks for both men and women (Minor et. al. 1980). Summer shelters, outside of the village, were often just a natural or hand built windbreak of brush or trees (Collins 1951).

Manufacturing technologies utilized many of the varied resources available to the Kalapuya. Produced items included mats, baskets, and clothing from grasses, cattails, tune, and other plants, animal skin clothing, mocassins, and hats, stone mortars and pestles, flaked stone tools, stone pipes and ornaments, antler, bone, wood and shell implements, canoes from hollowed cedar and fir logs, bark buckets, willow or hazel rope, yew bows, and many other items (Collins 1951, Zenk 1990, Aikens 1993).

As with most hunter-gatherer cultures, plant resources accounted for the largest portion of nutritional subsistence. Camas, roasted in pit-type ovens was the most important of the vegetable foods. Other nutritionally important plants included the wapato, tarweed seeds, hazel nuts, and several berry species. Tobacco (Nicotiana sp.) was cultivated by the Kalapuya, and tarweed plots cared for, if not cultivated. Although oaks were common in the valley, acorns were not an essential in the Kalapuyan diet. As will be discussed later, intentional burning of the prairie played an important role in the management of plant resources for the natives. Abundant wildlife resources were also available and utilized by the Kalapuya including deer, elk, small mammals, black bear, birds, fish, lamprey, and grasshoppers.

Epidemic Disease and Population

The ethnographic data discussed above needs to be tempered with some statements about several episodes of disease that swept the Willamette Valley and surrounding areas prior to the gathering of that data.

Population e stimates for Native Americans in the Northwest Coast region range from 100,000 to just over 200,000 people prior to the first contact with Europeans in 1774 (referenced in Boyd 1990, Ubelaker 1992a, 1992b). The Willamette Valley share of that population was around 16,000 (Boyd 1990).

While Native American populations in general have been found to have suffered a substantial disease burden (Aufderheide 1992, refs in Verano and Ubelaker 1992), northwest populations, through both historic and biological analyses, have not been found to contain any of the high mortality infectious diseases that commonly affect population size in large or epidemic proportions, prior to the arrival of Europeans. Several episodes of epidemic proportion diseases have, however, been documented within the 100 years following first contact. Smallpox appeared in the region in both 1775 and 1801 and caused mortality of at least 30 percent in the first outbreaks and less in the latter (see e. g. Thwaites 1959; and many references in Boyd 1990). A third epidemic, smallpox or possibly measles, occurred in 1824-25 and took a toll of 10 to 20 percent (Scouler 1905; Boyd 1990). The Tualatin Kalapuya are specifically mentioned by Gatschet (1877) and by Scouler (1905) regarding this third outbreak. Possibly the worst outbreak of disease occurred between 1830 and 1833 with the introduction of malaria to the lower Columbia and Willamette Valley. The disease is noted by many in the literature and death rates vary from 90 to 98 percent of the local populations (McLoughlin 1948 and other references in Boyd 1990). Just prior to the outbreak of malaria, Kalapuyan numbers were estimated at near 8800, but by 1841 there were only 600 remaining, a 93 percent loss (see Boyd 1990). Jacobs et. al. (1945) reports immigrant diseases such as dysentery and measles in the Willamette Valley in the 1840's. Smallpox again spread through the Northwest in 1836-38, 1853, 1862-63, and 1874. Total loss to the Kalapuya from original (1774) estimates of 16,000 to 1851 treaty estimates of 560 indicate a 96 percent total loss in population in just over 75 years. Boyd (1992) reports the average band size of the Kalapuya in 1851 was only 53 people. These bands, according to the 1851 census, did however remain spread over the valley in their own local band territory with minimal regrouping (Boyd 1992). Only after the population was forced to the Grande Ronde Reservation along with people from other tribes did cultural and genetic mixing occur to any great extent.

Kalapuya numbers were dramatically decreasing during the early 19th century, the time in which the first records of their existence were being written. By the time of Gibbs, Gatschet and other ethnographers very few Kalapuya actually survived. Undoubtedly, the effects of epidemic tragedy, and the sheer loss in numbers greatly influenced the cultural activity of the Kalapuya. The influx of European settlers, explorers, and traders into the region must also have affected the indigenous residents. Changing mortality rates affected fertility rates, a shift from seasonal movements to a more sedentary lifestyle, dietary changes, and extinction of some and fusion of other populations, all must have combined to alter the existing lifeways of the Kalapuya. These changes would have given rise to an ethnographic and linguistic recorded account different to some degree than what actually existed prior to contact with non-native peoples (note the example of a horse killed for use in the land of the dead cited earlier).

Chapter 3
Willamette Valley Prehistory

Environment and Cultural Ecology

The Willamette Valley is an entirely inland expanse in western Oregon bounded on the east by the Cascade Mountains and on the west by the Coast Range. The valley is approximately 120 miles in length and 20 to 30 miles in width. The Willamette River and its tributaries provide drainage for the region. The climate consists typically of mild, wet winters and moderate, dry summers. Precipitation, in the valley, averages about 40 inches annually, most falling between October and May. Geologic formation over much of the valley floor consists of Quaternary gravels, sands, and silts (Peck 1941 in Habeck 1961). These geomorphic surfaces consist of three formations important to human prehistoric occupation of the valley including the Horseshoe, Ingram, and Winkle units (Balster and Parsons 1968, Aikens 1993). The current, active floodplain is labeled the Horseshoe unit. The Ingram and Winkle units date between 550 and 3300 years before present (BP), and 5250 and 34,400 BP, respectively (Balster and Parsons 1968). Sites of human occupation are expected to be found within these geomorphic units.

The vegetational surface of the Willamette Valley has been modified extensively by human activity. The prehistoric landscape was one modified by continuous burning by Native Americans. The historic landscape initially saw the cessation of burning practices and an increase in farming, grazing, and later logging activity. In fact, some of the land has seen a complete cycle of burned prairie, to timber, timber harvest, and subsequent regrowth (Johannessen et. al. 1970; Towle 1974, 1979).

Currently the valley is characterized by extensive farm and grazing lands with scattered oaks, still maintained somewhat by field-burning. Despite this, however, relict prairie in the Willamette Valley may no longer exist , the current grasslands consist mainly of introduced

species (Habeck 1961). In addition to current grasslands, much of the original prairie and surrounding hillslopes have been overgrown with brush, succeeding to oak woodlands, and where left undisturbed, then succeeding to Douglas fir forest. The original densely forested bottomland riparian areas (Black cottonwood, Oregon white ash, bigleaf maple, red alder, Douglas fir) have been cleared for agricultural, urban, and industrial activity (Brackenridge 1841, in Sperlin 1931; Johannessen et. al. 1970). While some of the poorly drained wet prairie remains, much has been siphoned by irrigation systems and dams.

While some current conditions (i.e. areas of dense oak woodland and mature Douglas fir stands) may mimic a hypothetical (non-fire) climax community for the valley (referenced in Johannessen et. al. 1970) the prehistoric landscape was apparently managed at a much different level. Early accounts tell the story best:

> "These falls.....beyond which the country stretches into a vast level plain wholly destitute of timber." (William Clark's description of the land south of Willamette Falls, after talking to Indians at Wappatoo Island in 1806; Thwaites 1959).
>
> "The party again made a start, mooving (sic) slowly over an open prairie country, swelling gently into rounded hills with a few scattered Oaks along their Summits." (W. D. Brackenridge 1841 referring to the areas near the Yamhill River, in Sperling 1931).
>
> "Country undulating ; soil rich, light, with beautiful solitary oaks and pines interspersed through it, and must have a fine effect , but being all burned and not a single blade of grass except on the margins of rivulets to be seen." (David Douglas, traveling in the Yamhill area, September 27, 1826; Douglas 1959).
>
> the southern part of the valley is "... wild prairie ground gradually rising in the distance into low undulating hills which are destitute of

> trees, except scattered oaks..." and the hills bordering the Tualatin River are "...clothed to the very top with grass." (Charles Wilkes 1845, referenced in Towle 1979).
>
> "The practice of the Indians, then but recently discontinued, of burning the prairies over, had brought the whole country for miles together, to the condition of a park." (F. X. Matthieu describing French Prairie, Lyman 1900).

The prehistoric peoples then (at least in the late 18th and early 19th centuries), lived in a wide open, oak savanna environment maintained by the action of frequent fires. This savanna extended across the valley floor, and well up into the surrounding hillslopes . Habeck (1961), Johannessen et. al. (1970), and Towle (1974, 1979) all provide further evidence that a frequent fire regime occurred in the valley and that this regimen of fire was human caused.

Within this oak savanna an abundance of both plant and animal resources would have then been available for utilization by prehistoric occupants. Camas, tarweed, the native blackberry, strawberry, sunflower, hazel nuts, and oaks all depended, and even thrived, on the maintenance of an open landscape (Todt 1989; Boyd 1986; Towle 1979). In addition, abundant wildlife including elk, deer, bear, many small mammals, birds such as the common loon, various hawks, golden eagle, many small birds, and seasonally important an abundance of migratory species including geese, ducks and band-tailed pigeons would have inhabited the vast expanse of oak savanna (Brackenridge 1841 in Sperlin 1931; White 1975; Towle 1979). All of these species thrive in much greater numbers on this open plain than possible in a more dense forested environment, providing incentive and reason for the regular fire management practiced by the valley's human occupants.

Willamette Valley Archaeology

Archaeological evidence in the Willamette Valley indicates a human presence in the area dating back to Paleo-Indian times, possibly as old as the Clovis tradition (11,500 to 10,500 years BP) well-documented in other areas. This evidence includes scattered Clovis points found throughout the valley and some artifacts found in possible association with bones of the long extinct mammoth (Cressman and Laughlin 1941; Cressman 1947). Evidence of human occupation increases through the Early and Middle Archaic Periods with radiocarbon dates and artifact styles dated from 9000 to 2000 years BP. Documented sites include the Hannavan Creek, Flanagan, Benjamin, Hurd, Hager's Grove, and other sites (Cheatham 1988; Toepel 1985; Miller 1975; White 1975; Pettigrew 1980). The Late Archaic Period is represented by many sites including upper strata of some of the above sites, Flanagan, Benjamin, Hurd, and Hager's Grove, as well as many others including Perkins Park, several along the upper Long Tom River, Kirk Park, and the Fuller and Fanning Mounds (Cheatham 1988; Laughlin 1943; Aikens 1993).

Archaeological investigation in the valley has provided a framework for synthesis of settlement, subsistence, and human adaptation in the local environment. Collins (1951) began with a general overview of the early archaeological picture and compared the valley with surrounding cultures. White (1974, 1975) attempted to create a site typology and from this a settlement model for the valley (although see critiques of his work, Towle 1979; Connolly 1983). Connolly (1983) established a new framework for understanding the valley's intra-regional archaeological variation, but this work is far from complete. At present it appears the most likely future model will depict a pattern of regional variation in settlement and subsistence related to specific local resource conditions.

Fuller and Fanning Mounds - Willamette Valley Late Archaic Period

The Late Archaic Period in the Willamette Valley has been described archaeologically at several sites including the Kirk Park sites, Little Muddy Creek sites, and the Fuller and Fanning Mounds (Cheatham 1988, Davis 1970, Davis et. al. 1973, Laughlin 1943, Woodward et. al. 1975, Murdy and Wentz 1975). Along Little Muddy Creek several excavated sites revealed probable, seasonally occupied camps, with a full range of tools both lithic and bone, glass beads, copper items, incised petroglyphs, camas ovens and human burials (Davis 1970, Davis et. al. 1973). Cheatham (1988) found at Kirk Park an assemblage of sites including both base camps and task sites, and described artifacts and features depicting activities such as hunting and animal processing, gathering and plant processing, wood working, and stone tool-making, as well as settlement patterns, seasonality, and subsistence.

Laughlin (1943) described both the Fuller and Fanning mounds and the artifacts and burials discovered there, but offered little in the way of systematic classification of the artifacts. Woodward et. al. (1975) and Murdy and Wentz (1975) further classified the artifacts from the two mounds. Artifacts from the Fuller Mound include projectile points, knives, perforators, scrapers, a ceremonial blade and other miscellaneous chipped-stone tools, antler digging stick handles, antler wedges, chisels, and flakers, and antler ear spools, bone beads, needles, awls, blades, saws, flakers, dice, ornaments, and a whale bone club, shell beads (*Dentalium, Olivella, Glycmeris, Haliotis, Ipitonium* spp.), a baked clay object, and European trade goods including glass beads, brass buttons, copper bangles and copper beads. The excavators' field notes (Edmundson and Laughlin 1941-42), Laughlin (1943) and Collins (1951) also list finds not mentioned by Woodward et. al. (1975) including feathers, fire hearths, a lead ball, posts, planks, and fragments of wood and bark (cedar) associated with some of the graves, ground stone bowls, mortars, and pestles, and miscellaneous animal bones and teeth occasionally associated with the burials. Fanning Mound contained a similar assemblage of artifacts and

others not listed including stone drills and cores, incised pebbles (net weights?), pipe fragments, bone barbs and harpoon points, bone ornaments (a carved owl head), and historic items including brass finger rings, a brass spike, and a brass thimble (Murdy and Wentz 1975, Laughlin 1943, Collins 1951).

Placing the sites into a relative time frame with other Willamette Valley sites is complicated by the fact that the excavators did little recording of provenience of artifacts or burials. The sites did contain many historic trade artifacts placing at least the upper levels within the proto-historic period after 1774 and possibly as late as the early nineteenth century. Interestingly, with few exceptions the trade items found at the Fuller Mound were all associated with human burials, the rest being found only near the surface of the mound (Laughlin 1943). Laughlin (1943) hints that these burials may have been intrusive into a pre-contact midden that constitutes most of the site, although Woodward et. al. (1975) suggest the alternate explanation that traded items in early contact period may have been highly prized and thus owned only by individuals of high status. They also point out that the other grave goods of aboriginal origin associated with these burials are consistent with grave goods found in the rest of the burials, and thus no great temporal interval would have occurred between the different interments (Woodward et. al. 1975). At the Fanning Mound, historic trade items were found associated most often with burials exhibiting cranial deformation of the Chinookan type, which Laughlin (1943) states is atypical of the area until historic times. Laughlin (1943) further notes that at both mounds there appeared to be a difference in quality of workmanship of arrow points found above 50 centimeters as compared to those below this depth - those lower in the mounds being of better quality than those above - again evidence of at least two separate occupations of the sites. In studying the Fanning points, Murdy and Wentz (1975) substantiate this argument with the statement that point types "with pointed stems (types 10-14) were generally less well-made than those with straight or expanded stems (types 1-9)" in a tentative attempt to distinguish two components at the site.

In concluding statements about the Fuller Mound artifacts, Woodward et. al. (1975) state that "(The) Fuller Mound collection, along with that from the nearby Fanning Mound, constitutes the most diverse inventory of artifacts recovered to date from the Willamette Valley." Both articles (Woodward et. al. 1975, Murdy and Wentz 1975) comment on the demonstrated assemblage affinities the sites show for each other as well as for other sites in the valley. They also mention the many "exotic" artifacts suggesting contact or influence from neighboring cultures, for example the ceremonial obsidian blade similar to those found at Gold Hill in southwestern Oregon (Cressman 1933a, b), the whalebone salmon clubs usually found on the coast or along the Columbia River, and the staring eyes motif of the owls head carving looking very similar to items found along the Columbia River and Plateau areas. The two sites then, seem good representations of Late Archaic Kalapuya occupation of the Willamette Valley. The information from the excavations falls short, however, in that provenience and detailed records of stratigraphy, features and associations were not kept and many artifact types (lithic debitage, faunal bone, plant materials, and some fragmentary human remains) were discarded or lost.

It should be noted that "mounds" in the Willamette Valley are not strictly burial mounds, but are often purposefully mounded soils intended to raise the ground above flood level. Looser top soils from the surrounding area would be carried in baskets to the mound site and redeposited (Brauner pers. comm.). Typical midden-like build-up of soils would also occur with extended occupation of the site. Burials were then easily interred into the softer mound soils.

Prehistoric Oregon Skeletal Populations

While limited information regarding prehistoric populations is available for the Willamette Valley and surrounding areas some studies have been completed to varying extent.

Populations are known from the interior southwestern Oregon (Gold Hill Site, Cressman 1933a, 1933b, Ferllini 1989), the southwestern Oregon coast (Lone Ranch Site, Berreman 1944), the lower Klamath Lake in northern California (Nightfire Island Site, Bennett 1972, Sampson 1985), the Malheur Refuge in southeastern Oregon (Hemphill 1992a, 1992b, 1992c), the Coquille River estuary on the Oregon Coast (Hall 1993, Hall n.d.), and some work in the Willamette Valley (Laughlin 1941, 1943, Collins 1951).

Cressman recovered remains from 39 individuals at the Gold Hill site along the Rogue River in southwestern Oregon in 1930-32 (Cressman, 1933a, 1933b). The remains are most likely of the Takelma Indians that occupied the area, although they may represent a chronologically dispersed group. Most of the burials were so fragmentary that the remains were not saved, although Ferllini (1989) reports parts of 29 individuals were recovered. The burials were always found in a flexed position, typically on the left side with head oriented south, and an abundance of grave goods was usually found associated with each burial including many large obsidian "wealth" blades commonly associated with the Yurok and Hupa cultures of northern California. Cressman (1933b) reported cranial data on ten individuals, however, he notes (1933b pg12 Table 1) that half-size scale drawings (craniograms) were made of the skulls and that measurements were taken from these pictures. Ferllini (1989) remeasured the cranial remains from the site using more reliable techniques. While sample size for each measurement is small (N = 1 to 8) the results are useful. Comparative summary of Ferllini's cranial data with that of the Fuller and Fanning remains is presented in Tables 12 and 18.

Berreman (1944) reported on recovery of 34 individuals from the Lone Ranch Creek site located near Brookings, on the southern Oregon coast. The burials exhibited a variety of burial type, position, orientation and artifact associations , although a north-south orientation was common (Berreman 1944). Nineteen individuals were considered complete enough for some cranial analysis. Some of this data is summarized in Table 15 for comparative purposes. The site is considered to be of Late Archaic occupation and was probably inhabited by late-

arriving Athapaskan speakers. The burial remains did not seem to be separated by any great time intervals and thus may represent a relatively tight population.

Remains of 45 individuals were recovered from the Nightfire Island site in northern California along the lower Klamath Lake (Bennett 1972, Sampson 1985). The remains belong to the Modoc Indians, a group speaking one of the Penutian languages and thus possibly related to the Gold Hill Takelma and the Kalapuya of the Willamette Valley. The burials revealed much about the cemetery and crematory practices of the Modoc, as well as the violent nature of many deaths. Burials were typically flexed, lying on either side or the back and had various orientations. Associated artifacts included Olivella beads and other ornaments and tools, and projectile points, in place, often indicated death of a violent nature (Sampson 1985). Upon placement in a shallow burial trench, an individual would then have been cremated by placing a pyre of fuels over the top (Sampson 1985). Analysis of the remains occurred in 1969 by Bennett but was not published until Sampson (1985) completed analysis of the entire excavation. Bennett (1972) did, however, report on the occurrence of lumbo-sacral malformations and spina bifida occulta in the group. Osteometric analyses, and age, sex and stature determinations were performed but due to the highly fragmentary nature of the remains (from cremation) the sample size for any particular analysis is small. The most interesting hypothesis from the study was that the Nightfire Island group was apparently somewhat inbred as evidenced by the high incidence of vertebral deformities and a lack of variance in the stature and general proportions of the male population (Bennett 1972). A summary of some of the data is presented in Table 13 for comparative purposes.

A recent study of remains collected from many sites in the Malheur Lake area of southeastern Oregon is nearing completion. Hemphill (1992a, 1992b, 1992c) has produced three volumes of data, with a summary volume expected in 1994. A total of 53 individuals and many isolated human elements were analyzed. These remains, while all found in the Malheur Lake area, come from many sites and may be widely dispersed in time. Nevertheless they do

constitute a large sample of individuals from a specific region and the data will be useful in comparison to other populations. The summary volume of data is highly anticipated.

Oregon State University researchers have excavated remains from a total of 15 individuals from sites along the Coquille River at its mouth (Hall n.d.). Analysis of the remains has included estimates of stature, age, and sex, study of dental characteristics, as well as a series of metric and non-metric assessments (Hall 1993, Hall n.d.). This population likely dates (with one exception) to the last few centuries but may contain individuals from two stocks including an older Penutian speaking group with long ties to the area and an Athapaskan speaking group arriving between 500 and 1,000 years ago - admixture of the groups is probable and likely (Hall n.d.). As with most other Oregon skeletal populations the sample size is small. Hall noted a small statured, but robust, healthy population. Table 14., again, contains some summary data for comparative purposes.

In the Willamette Valley the Fuller and Fanning remains make up the bulk of the human skeletal material recovered to date. A few other burials were generally described by Laughlin (1941) from the Harrisburg, Miller, Halsey, and Shedd Mounds, but no metric analyses have been published on these materials. Recently human remains were excavated from two sites near Albany (Kalapuya Midden and Muddy Creek sites) with publication expected in the spring of 1994 (John Fagan, pers. comm.). These recently discovered remains may provide the best local Kalapuya population for comparative studies with the Fuller and Fanning materials.

Anthropologist, Franz Boas, as part of the Columbian quatracentennial, measured thousands of native people all over North America, including the Pacific Northwest and the Kalapuya (Cybulski 1990, Jantz et. al. 1992). This data includes a series of measurements on each individual as well as the individual's age, sex, band, and each parent's band. The sample size is small, but consists of measurements of living individuals which should be very useful in correlating measurements on skeletal populations from the same area. Boas' data includes four

male individuals whose tribe is given as "Yam Hill" aged 25, 45, 90, and 100 years. The parents of these four are also listed as Yam Hill (with one of the mothers being listed as 1/2 Yam Hill and 1/2 Luckamutti). The data also includes 15 individuals (10 males aged 18-71 years, 5 females aged 27-70 years) reported as Kalapuya, five belonging to the Luckamutti band, the others having no band recorded. Parentage of these individuals is listed among various groups including Callapooya, Luckamutti, Santiam, Yam Hill, Clackamas, French Canadian, and American. Only two of the individuals also have European ancestry, and one has Clackamas heritage, the rest are of Kalapuya descent. Some of the anthropometric data is summarized in Table 16 for comparative purposes.

Chapter 4
Materials and Methods

General Accounting

In the original research on the human remains from Fuller and Fanning mounds, Edmundson and Laughlin apparently assigned burial numbers (e.g. Fuller #10) to remains found in a single grave with some attempt at separation of individuals. Field notes for the excavation, however, are scant and give little clue to specific methodology and almost no clue to true provenience of any individual (although non-specific locations and sketches are often provided, see maps in Appendix E). At some point in time the Oregon State Museum of Anthropology (OSMA) assigned accession numbers to each individual (e.g. Fuller #10 was assigned OSMA # 11-162). The museum tried to label each element (whole or fragmentary) of each individual with the accession number. However, occasionally more than a single individual given a single burial number. Number of individuals was apparently not always originally determined for each burial. In addition, several burial numbers and the associated remains are apparently missing (e.g. Fuller #1). These remains are not at the OSMA and have no assigned accession numbers. Laughlin (personal communication 1993) did not know the current location of these remains. In this paper all previously assigned numbers (burial numbers and OSMA numbers) are maintained and letter designators are added when more than a single individual is associated with the same identification numbers (e.g. Fanning #14, 11-198, has three individuals now designated with an a, b, c). In addition, three individuals apparently from Fuller mound have OSMA numbers (11-174, 11-169, 11-164) but no original burial number. These have been here designated Fuller #'s xx, xy and xz for bookkeeping purposes. Occasionally, single extra bones or fragments, having little analytical value (for the present study), were found labeled with the remains of another individual. In these cases the extra items were not given new numbers, and are reported only as "extra elements" under the individual with whom they were found.

A total of 66 individuals, 44 from Fuller and 22 from Fanning, are considered in this study. (This total does not include the "extra elements" mentioned above). However, 11 of these from Fuller and 6 from Fanning had no remains available for study - only information from previous works (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951).

A total of 96 hours were spent in the laboratory analysis of the skeletal remains. In order to test reliability of metric and non-metric observations all crania were measured on two occasions with a one month time interval. Second measurements agreeing within one millimeter were considered accurate. Those disagreeing by more than one millimeter were carefully remeasured and an accurate observation recorded. Second estimates of non-metric traits found in disagreement with the original assessment were re-scored by studying the definition of the trait (see below) and then reassigning an estimate. In cases where a clear decision could not be made an assessment of "indeterminate" was recorded.

Inconsistencies in information on the various burials exist between what is stated in the field notes (Edmundson and Laughlin 1941-42), Laughlin (1943), and Collins (1951). Data from all three sources is reiterated here and some attempt at reconciliation is made (refer to the burial descriptions, Table 19, Appendix A).

Morphological Description and Identification

For each individual, single bones and fragments were identified by element and side (reference Brothwell 1981, Bass 1981, Shipman et. al. 1985, Olivier 1969, Gray 1976). Preservation of each element was assessed according to completeness and by the following category:

present - the element is whole or nearly so, such that all analytically necessary anatomical landmarks are present.

fragmentary - the element is present but incomplete, it may be identifiable to element and side. Some analysis may still be possible. Fragments unidentifiable to element are listed with as much information as possible, e.g."unidentifiable long bone fragment".

missing - element is not identifiably present.

Post-cranial long bones are further divided into elemental portions (proximal, distal and diaphysis) and then categorized as above. Other post-cranial bones are divided into elemental portions and then categorized (e.g. the innominate is divided into the ilium, ischium, and pubic sub-elements, and the ilium further into the auricular surface and acetabular regions).

Each individual is also described in a general morphological sense and any pathology or anomaly is discussed. This description includes general appearance of the bones (ruggedness, damage etc.), evidence of disease, evidence of cultural practices, and any unique or abnormal conditions.

Osteometric and Non-metric Analysis

Each individual was subjected, where possible, to a series of cranial non-metric, and metric analyses including measurements of the crania, innominate, and femur. The measurements adhere to those described in standard osteologic texts, but Olivier (1969) is utilized as the base reference for cranial landmarks and definitions of measurements (but also see Bass 1981 and Howells 1973). Non-metric traits are referenced from Berry and Berry (1967) except for presence of sagittal bones which has been added to their list.

Laughlin provides measurement results of some individuals in the field notes. These are mentioned within each burial description and compared to current results. Laughlin's

femoral lengths (maximum morphological length) were utilized in a few cases to obtain stature estimates when it was currently impossible to obtain the measurement for that individual.

Measurements were taken with standard equipment including both spreading and sliding calipers, an osteometric board, and mandible (hinged) board. The procedure for measuring an individual was to lay out each element to be measured, review the definition and then proceed to take the measurement and record it. Non-metric traits were scored in a similar fashion by reviewing the definition of the trait and then scoring that trait as positive, negative or indeterminate. Recording was done using a standard form utilized at Oregon State University, Department of Anthropology. Definitions were clarified from the references and spelled out on a check list which was kept at hand at all times. The list of definitions included cranial landmarks used in the measurements and trait assessments, the name and procedure for taking the measurement, and name and procedure for assessing the trait. The check list of landmark definitions, metric definitions and techniques, and non-metric traits descriptions is presented in Appendix B.

Dental Analyses

Teeth are enumerated for each individual as present, missing (antemortem or postmortem), or bone missing (at the tooth site). They are also assessed according to various attributes including shoveling, presence of abscesses, impaction, crowding, state of eruption, presence of caries, and attrition level.

Each tooth is identified by type (incisor, canine etc.), whether it is deciduous or permanent, maxillary or mandibular, and by side. Missing teeth are classified as, missing antemortem (and bone resorption or abscess, if any, is noted), postmortem, or bone missing. Incisors are noted for extent of "shoveling", commonly found in Native American populations. State of eruption is recorded as fully erupted, not erupted, not fully erupted, or impacted.

Crowding between teeth, and any obvious effects on the individual are noted. Pathological conditions such as abscesses and cavities are noted and described by extent, location and effect on the individual. Attrition levels are assigned to each tooth according to the methods outlined in Hall and German (1975). See Appendix D for description of attrition levels.

Sex Estimation

Sex of each individual is estimated whenever possible. Laughlin (1943) and Collins (1951) both listed sex estimate s for some individuals. Those estimates are reiterated for comparison. Three methods were utilized to determine sex including cranial morphology, pelvic morphology, and femoral head diameter.

Indication of sex from cranial morphological traits is well described in the literature (see Krogman 1962, Olivier 1969, Bass 1981, Shipman et. al. 1985,). While sex estimates from the crania probably rank second in reliability to the pelvis, they were more numerous and better preserved for the two site populations at hand. Sex estimates for this study rely primarily on cranial morphology with other factors (pelvic morphology and femoral head diameter) in supportive roles - although pelvic morphology was given a lot of weight in carrying estimates for those individuals with at least fair innominate preservation.

Cranial traits utilized in separating males from females is based on the general assumption that males are more robust and will therefore show a more rugged and muscle-marked skull than females. Some problems arise from this methodology (see especially St. Hoyme and Iscan 1989). First, it is unknown how representative this sample population is of the Yamhill (or greater Kalapuya) population from which it is derived. Second, while the human species is demonstrated to show sexual dimorphism in the characteristics utilized, it is unknown how dimorphic the study population is, nor which characters are more valuable in separating the sexes for this population. Next, many of the standard characteristics used to

distinguish sex were initially based on non-Native American populations and thus may have different or no utility in classifying sex in the sample population. Also, the traits are applicable to only the adult segment of the population, while accurate methods for sexing sub-adults are not well-developed. Finally, these traits are never absolute, but include intermediate forms that lie somewhere in between the typical male or female. For these reasons, more than two categories of sex are created in this study including Females, Females?, unknown, Male?, and Male (after Moore-Jansen and Jantz 1989). Cranial features utilized in distinguishing males from females in this study include:

1. Supraorbital ridges are typically more prominent in males than in females.
2. Superior edges of the orbits are more blunt in males than in females.
3. The forehead is more retreating in males, while greater development of the frontal eminence and a smoother, more rounded forehead exists in females.
4. The mastoid processes are larger in males than in females.
5. The zygomatic process of the temporal bone is more rugged, and the zygomatic bones are higher, heavier and more rugged in males.
6. Heavier nuchal crests, external occipital protuberances, and temporal lines are found in males than in females.
7. The palate is larger and broader in males.
8. The mandible in males is generally larger, heavier, has a higher body and symphysis, and broader ramus. Males have a square, protruding chin while the female chin is more pointed.
9. The gonial angle is less obtuse in males (less than 125 o) and the gonial region more stout and rough.
10. Overall appearance of male skull is rugged, rough, more sculpted, and robust. Female skull is more delicate, with smoother areas of muscle attachment.

Sex estimation based on pelvic morphology also rests somewhat on the assumption of larger male size and robusticity. In addition, however, morphological changes associated with female adolescent growth (in preparation for child-bearing), child-bearing, and parturition create the most reliable sex identification methods in skeletal studies (St. Hoyme and Iscan 1989, Bass 1981, Phenice 1967). The same problems in methodology listed above occur again in estimating sex from the pelvis. Sex-related morphological characteristics of the pelvis utilized in distinguishing males and females in this study include:

1. The sub-pubic angle tends wider in females than in males due to the longer pubis.
2. The sciatic notch tends to a wider angle in females than in males.
3. The obturator foramen is typically larger and more oval in shape in males than in females.
4. The acetabulum is usually larger in males than in females due to the larger size of the femoral head.
5. The pre-auricular sulcus may occur in both sexes, but more often in females. The groove tends to be wider and deeper, and is often pitted in females due to the stresses of childbirth. A wide, pitted sulcus indicates female, however, absence or non-pitting of a shallower groove does not necessarily indicate male.
6. Females in general have a wider, elliptical pelvic inlet compared to a narrower, heart-shaped inlet in males.
7. A ventral arc appears as an elevated ridge of bone on the ventral surface of the female pubis, and as only a slight ridge or not at all on the male.
8. The subpubic concavity exists as a lateral curvature of the ischio-pubic ramus (in dorsal view) in the female just inferior to the pubic symphysis. The concavity occurs only slightly or not at all in males.
9. The medial aspect of the ischio-pubic ramus in the female shows a ridge of bone or narrow surface, and in the males is usually broader and flat.

The last three of the above criteria are described in Phenice (1967) who used them to identify sex with an accuracy of greater than 95% (in a population of Euro- and Afro-Americans). Unfortunately, in the Fuller and Fanning population, very few pubic bones were well-preserved enough to utilize this technique. The most common of the above characteristics utilized (due to the state of preservation of the pelves in this population) were the sciatic notch and the pre-auricular sulcus.

Femoral head diameter was the last criterion used in estimating sex. Again, the same methodological problems as listed above occur. Pearson (in Bass 1981) studying a 17th century London population created the following method for estimating sex from the diameter of the femoral head:

If diameter of femoral head is,	then
< 41.5 mm	Female
41.5 - 43.5 mm	Female?
43.5 - 44.5 mm	unknown
44.5 - 45.5 mm	Male?
> 45.5 mm	Male

In this study, femoral head diameters were measured (see measurement methods already discussed) and the above criteria applied for estimating sex. (But see the discussion of results section for a reassessment of this method for this population).

Age at Death

Age of the individual at death was estimated whenever possible. Laughlin (1943) and Collins (1951) also estimated age at death for some individuals but limited categories of age to terms such as adult, mature, adolescent, young adolescent, child, and infant. Only rarely was age in years applied (never in Laughlin 1943, once in Collins 1951, occasionally in the field notes, Edmundson and Laughlin 1941-42). Ages applied by the previous researchers are

repeated in the results section for comparative purposes. Methods of determining age at death are from several sources in the skeletal remains.

First, dental eruption sequences were studied. These are known to produce accurate age at death estimates up to about 21 years of age, when teeth are generally fully erupted (eruption sequences referenced in Bass 1981, Brothwell 1981, Shipman et. al. 1985). Dental attrition levels are also utilized, but are used to suggest only crude relative ages, i.e. heavier attrition indicates greater age (see Hall and German 1975, Hall 1976, Brothwell 1981, Lovejoy 1985).

Epiphyseal appearance and union of the various bones can also be a reliable indicator of age (Bass 1981, Brothwell 1981, Shipman et. al. 1985). Fusion of epiphyses occurs during adolescence (13-21 years), and so along with the latter stages of dental eruption provide precise estimates of age for this period. While similar problems as listed above may occur in estimating age from epiphyseal union, the sequence of union has not been found to differ significantly among races (Krogman and Iscan 1986, Johnston and Zimmer 1989). However, most tables listing age of union for the various ossification centers were created from studies of recent and/or living populations of well nourished individuals - prehistoric populations may differ to some extent. In addition it should be noted that females tend to mature skeletally by as much as two years earlier than males (Shipman et. al. 1985). References utilized in this study outlining appearance of epiphyses, onset of fusion, and final union of epiphyses were taken from Bass (1981), Shipman et. al. (who separate male and female ages, 1985), Krogman and Iscan (1986), and Brothwell (1981). A range of ages associated with union at specific centers of ossification is utilized as opposed to single age assignments - although when several bones and their epiphyses are available for study in a single individual the range may be quite narrow.

The pubic symphysis has long been used as an indicator of age es timation beginning with the work of Todd (1920, 1921a, 1921b), who noted several phases through which the pubic symphyseal face progresses with advancing age. These methods have been subsequently modified and discussed by several researchers (McKern and Stewart 1957, Gilbert and McKern

1973, Meindl et. al. 1985, Jackes 1985, Iscan and Loth 1989). Although some differences are believed to exist between sexes, races, and temporally separate populations (Iscan and Loth 1989), nevertheless, the various systems have provided a standardized means for aging. Utilized here are the methods of McKern and Stewart (1957) for males, and Gilbert and McKern (1973) for females. Also utilized is the suggestion of Jackes (1985) that using mean values for age scores (which provide an unreal age) derived from the above methods is not as valid as using 95% probability distributions to create an age range for the individual at hand. Thus , in the current study, a total score utilizing McKern and Stewart or Gilbert and McKern methods has been determined and then an age range encompassing 95% of all possible real ages for the individual assigned (associated age ranges are published in Jackes 1985). It should be noted that these methods apply only to individuals in the age range 17 to about 50 years of age (McKern and Stewart 1957, Gilbert and McKern 1973).

Methods for estimating age at death of individuals less than 21 years old from the Fuller and Fanning population are adequate (i.e. dental eruption sequence and epiphyseal union). For those individuals greater than 21 years, estimations become more difficult. So far, only the morphological changes in the pubis and crude estimates from dental attrition levels have been mentioned. While the pubis produces a relatively reliable estimate, the number of pubic bones preserved in the population is few. The use of cranial suture closure as a reliable estimator of age has been controversial (Todd and Lyon 1924, 1925a, 1925b, 1925c, Brooks 1955, Iscan and Loth 1989) but, a recent approach suggests some value when used with other age indicators (Meindl and Lovejoy 1985). The Meindl and Lovejoy method assigns age-related scores based on degree of ectocranial suture closure at specific sites. A composite score based on several sites is then computed and an estimated mean age and age range for that score determined. Unfortunately, for this method, the age range varies from a minimum of 27 years to a maximum of 53 years (Meindl and Lovejoy 1985, Table 6 and 7) which does not assign individuals to age classes. Additional help in assigning age estimates comes from looking at

endocranial suture closure (Todd and Lyon 1924, 1925a-c,). In order to tighten the age class estimates for individuals in this study (and because few crania were complete enough to score all sites in the Meindl and Lovejoy method), the average age by suture scores for specific sites (Table 3 in Meindl and Lovejoy 1985) was used instead of the composite score, and additional evidence of age from endocranial suture closure estimates was considered. An age range based on evidence from endocranial suture closure, which typically begins earlier than ectocranial closure, and then an array of mean ages from specific site scores from the Meindl and Lovejoy (Table 3, 1985) method, were combined into a "best guess" range of ages for the individual. This method usually provided an age range estimate of 5-10 years (with the typical 10-12 year standard deviation from the mean found in Meindl and Lovejoy 1985 understood). As the methods utilized were developed on populations of Euro- and Afro-American males, and standards for native American samples have not been developed, it should be pointed out that populational differences could exist. Todd and Lyon (1924, 1925b) however, concluded that separate standards for the sexes or for African or European races were not necessary, while Meindl et. al. (1985) did not separate by race or sex.

Stature Estimation

Stature estimation allows the researcher and general reader to begin forming a visual picture of the population described. Stature may be determined from skeletal remains in several ways including re-articulation of the entire skeleton and measuring (allowing for cartilage and intervertebral discs), although this was not possible here due to the fragmentary nature of the post-cranial remains of most individuals. Other methods, utilizing the various long bones of the post-cranial skeleton are considered relatively reliable in estimating stature (discussed in Krogman 1962, Bass 1981, Brothwell 1981, Shipman et. al. 198). For the Fuller and Fanning population the only bone consistently well-preserved for many individuals was the femur.

Several regression formulae and ratio methods have been developed for femur stature estimation including those of Trotter and Gleser (1952, 1958), Genoves (1967), Neumann and Waldman (1968). Trotter and Gleser (1952, 1958) studied Euro- and Afro-American males and females, and mongoloid, Mexican and Puerto Rican males, Genoves (1967) looked at Mexican indigenes, Neumann and Waldman (1968) studied a middle Mississippian prehistoric population. To date, no formula has been developed for west coast Native American populations and so the formulas developed from native and Asian samples are probably the most applicable for use in the present case. Trotter and Gleser's (1952, 1958) formulae have become the traditional standard used in much of the literature, with Genoves (1967) work as an alternative. Neumann and Waldman's (1968) work is utilized to a lesser extent but is particularly applicable here as it is the only formula developed on a pure Native American population. For the current study, attempt at stature estimation was made by utilizing all of the available and applicable formulae mentioned above (i.e. Trotter and Gleser's mongoloid males, Genoves' Mexican male and female, Neumann and Waldman's male and female). An estimated stature range is then created for each individual. Population means are then calculated by each method (separated for males and females) and a range of means provided.

Comparative Analyses

Comparative analyses have been completed for craniometric traits between males and females, between the Fuller and Fanning sub-populations, and between the combined Fuller / Fanning sample and other relevant populations for which data exists, utilizing unpaired, two-tailed t tests. A 0.05 level of significance will be used to indicate real difference between means.

Cranial non-metric variation will also be compared between males and females, between the Fuller and Fanning sub-populations, between cranially deformed and non-

deformed individuals, and between the combined Fuller and Fanning population with other known populations. A chi-square frequency analysis (with continuity correction) will be utilized to determine differences in rate of occurrence of the various traits between populations. Again, a significance level of 0.05 is applied to indicate real difference, although other levels may be reported.

Stature estimates for the combined population will be separated by males and females and then compared to other known populations. Again, unpaired t tests will be utilized and a significance level of 0.05 taken to indicate real difference.

Chapter 5
Results

Number of Individuals

A total of 66 individuals was analyzed for the purposes of this study. Forty-four of these were from the Fuller site and 22 were from the Fanning site. Eleven of those from Fuller and six of those from Fanning were only studied through the notes and published works of previous researchers (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951) because no remains were present at the Oregon State Museum of Anthropology (OSMA). Several of the separate individuals also had "extra" elements (not belonging to that individual, but labeled as such), including nine from the Fuller site and four from Fanning. At least one of these (Fanning #12) has extra elements most likely belonging to another known individual (Fanning #2) - see Table 19, Appendix A.

Summary of Burial Descriptions

Each individual burial is separately described in Table 19, Appendix A. Summary information, on specific topics (metric, non-metric, dental analyses etc), for all burials, is also compiled in the various tables and discussed below. Burial descriptions in Appendix A are divided into several sections, the first page of which includes summary data on burial attributes (type, side, orientation etc.), sex, age, and stature estimates, and a summary of the various notes and statements made about the specific individual by the original researchers (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951). The next pages include a case description, notes on the preservation and inventory of the remains, sex determination, age at death, stature estimation, the metric and non-metric analyses performed, dental analyses, pathologies and or anomalies present, and any other pertinent information.

Burial Type

Burial type was typically found listed in Laughlin (1943) or Collins (1951), and confirmed in the field notes (Edmundson and Laughlin 1941-42). Burial types were distributed between flexed, with both arms and legs bent, and semi-flexed, with legs bent, and arms (one or both) extended. Thirty-six individuals have known burial types while 30 were not reported in the literature or notes. Thirty-one of these (86.1%) were of the flexed type (23 at Fuller, eight at Fanning), and five (13.9%) were semi-flexed (three at Fuller, two at Fanning). No other burial type was recorded. Interestingly three of the five semi-flexed burials have extenuating circumstances which may account for their lack of complete flexure. Fanning #1 had legs flexed, but the remains of the arms were very fragmentary and few in number and thus it may have been impossible to determine flexure. Fuller #31 (knees flexed) was intrusive into and mixed somewhat with #30, possibly affecting the burial type. Fuller #39 had only its left arm extended, and had been disturbed such that it was pushed from lying on its right side to partially lying on the face (upper body at least) with left arm extended. The fourth, Fuller #5, is listed by Laughlin to have been flexed but by Collins as semi-flexed. A sketch in the field notes show the individual with knees drawn up, but arms extended above the head. Fanning #4b lay with its legs flexed but arms extended. Flexed burials it would seem, were the rule at these two sites, with only occasional divergence. Many of the burials were intruded into the hard Willamette Valley clay soils below the softer mound soils - one wonders whether a flexed burial has some cultural significance or is it just convenient to dig as small a hole as possible and place a more compact, flexed, burial into the harder soils. Wilfred Wasson, of the Coquille tribe, has said that flexed burials were to reduce the amount of digging necessary for interment (Wasson, pers. comm. with Roberta Hall).

Side

Flexed burials are typically laid in the grave lying on one side or the other. Again this information was recorded for many individuals in the previous literature (n=38). Twenty (52.6%) of these were found lying on their left side, while 15 (39.5%) were found on their right. Two (5.3%) individuals were found lying on their back, and one (2.6%) was found on its face. However, of these three, the individual on its face (Fuller #39) was apparently disturbed by shifting soils and had originally laid on its right side and Fuller #5 lay on its back (with arms extended above head) but the legs were drawn and lay on their left side. Only Fanning #7 was definitely placed on its back. There would appear to be no real preference for side in burials at either site - at Fuller 57.1% were on the left, 35.7% on the right, and at Fanning 50% were on the right and 40% on the left.

Orientation

Orientation of burials is recorded for both sites, also in the previous literature. Orientation is typically described as the direction in which the head points (i.e. the inferior-superior direction through the skull), but occasionally Collins names the direction in which the head "faces" (i.e. the postero-anterior direction through the skull). Orientation was recorded for thirty-four individuals, but not recorded for the other 32. All of the cardinal (N, S, E, W) and sub-cardinal (NW, SW, SE, NE) directions are represented by at least one burial at the Fuller site (n=24), but the Fanning site (n=10) had no burials oriented to the south, southeast or northeast. Eight (23.5%) were buried with head to the north, five (14.7%) with head to the northwest, six (17.6%) with head to the west, five (14.7%) with head to the southwest, one (2.9%) with head to the south, three (8.8%) with head to the southeast, four (11.8%) with head to the east, and two (5.9%) with head to the northeast. Again, no overwhelming preference for orientation is apparent for burials at these sites.

Grave Type

Grave type was never recorded in the field notes except occasional burials are stated to be "intrusive" into the clay layer below the mound soils, into the various strata of the mound, or into other burials. Collins (1951) describes many burials as "pit" burials, but his source of information is uncertain and the term "pit" is not defined. Here, grave types are described only when information on the soils or the intrusive state of the burial is provided in the notes. The term "pit burial" is used here, in keeping with Collins, and defined simply as an intrusive burial. It is applied only when evidence from the notes suggest intrusion to be the case. As an example, Fuller #30 is noted to have been intrusive into the sub-mound clay (i.e. the original prehistoric surface), but surrounded by mound soils. Fuller #37 was also noted as intrusive into the sub-mound clays. Fuller #39 was intruded into the clay 4-6 (inches)" and the "dirt was very loose and dark, with little clay" (i.e. the grave must have been dug through some mound soils, into the clay, and then refilled with mound soils with small amounts of clay intermixed). In the area of Fanning #16 "...a 3-6 (inch) layer of ash appeared throughout the 6 (foot) hole at about 30 (inches) deep except just above the burial, where it was missing." All of these burials (and others) were thought to be intrusive holes or pits into the soils in which they were found. No other grave types were suggested in the notes or literature for these sites. Four burials at the Fanning site have evidence of pit grave type in the notes (Collins lists two additional burials as pit type, but his source of information is unknown). Seven of the Fuller burials have notes suggesting pit type graves (Collins lists 11 additional burials at Fuller as being pit type, but again, his source of information is unknown). All other burials are listed as "unknown" for grave type.

Cedar bark or wood is associated with a few individuals and sometimes it surrounds them. This may suggest a grave box was occasionally used for some burials. Fuller #18 had cedar bark or wood surrounding the skeleton, Fuller #39 had cedar bark fragments about the pelvis, possibly indicating burial practice but more likely a form of clothing (cedar bark skirt),

and Fuller #40 had the remains of a cedar post (possibly historic) nearby, a vertical cedar plank just north of the skull, and many cedar fragments about the skeleton. This practice is not specifically noted in the ethnographic literature for the Kalapuya but it is for other Oregon cultures including the southwest Oregon Takelma and Athapaskan peoples. An informant of Jacobs et. al. (1945) does mention "...they made a wooden fence..." when discussing male burials - it is uncertain whether this fence is within the grave or above ground.

Associations or Grave Goods

Burials at both sites contained associated grave goods, often in abundance. At the Fanning site 12 individuals had known associations, six were listed as having no associated artifacts, and four are unknown as to associated artifacts. Burial goods included elk-horn wedges, projectile points, fish vertebrae, broken and complete mortars, stone bowls, stone mauls, pestles, a sandstone disc, antler digging stick handles, an owl's head carved in bone, and other items. No infants (< 2 years) or children (2-10 years) have associated artifacts although Fanning #9 (infant) was buried with Fanning #6 (adult), and Fanning #17 (infant) with Fanning #16 (unknown age). The associations with Fanning #14a are unknown but a green copper stain on the left zygomatic bone suggests copper items were buried with this individual. Fanning #7 had a phallic pestle in the left hand with its tip resting at the site of the missing mandible. Only one individual, Fanning #3, had shell (*Olivella* sp.) and bone beads associated. The Fuller site on the other hand has many burials with associated shell and bone beads decorating various parts of the body. In addition, Fanning burials typically have only a few items listed with each burial, while Fuller burials often have numerous shell and bone beads and long lists of other items associated with the remains.

Twenty-three individuals at the Fuller site have known associations, while eight are unknown as to their associations. Thirteen are listed as having no associated artifacts, Fuller burial goods include shell beads and pendants (*Olivella, Dentalium, Littorina, Turtella,*

Acmae, Pelecopoda, and an unknown bivalve species listed,), bone beads (some used as nose plugs?) and pendants, stone drills, projectile points and scrapers, antler labrets or ear plugs, antler digging sticks, bone awls, whalebone clubs, a bone poniard, a large obsidian blade, feathers, animal remains (bear penis bone, bird bills, cat claws), feathers, cedar bark, wood and fragments, and trade items such as copper pendants, copper bangles, copper buttons, a glass bead, and some corroded iron fragments.

The shell and bone decorations were often found around the neck, shoulders, arms, pelvis, legs and ankles. Copper pieces, feathers, and other items were occasionally intermixed with the shell and bone. The feathers were typically stained with copper (probably the reason for their preservation). Interestingly, no groundstone items are listed with the Fuller individuals in contrast to the Fanning burials which had several stone bowls, mortars, pestles and mauls mentioned.

Similar to the Fanning site, none of the six individuals at Fuller thought to be less than two years of age, has associated burial goods (Fuller #'s 16, 17, 22, 23, and 32 listed as no associations, #27 is unknown). Fuller #29, aged 5-12 years, also had no grave goods. Children with associated items include Fuller #11 (aged 11-12 years) and Fuller #18 (aged 9-12 years). Adolescent and adult individuals had many associated items, a few items, or none. Some sex differences may be apparent as only females had digging stick handles, and only males have the whalebone clubs, long obsidian blade, bone poniard, and antler labrets or ear plugs (sample size is too small, however, to generalize sex differences in grave goods).

Possibly the most interesting association is the occurrence of trade items and abundant other goods almost exclusively with cranially deformed individuals. Five individuals from Fuller (#'s 3, 4, 10, 39, 40) exhibiting cranial deformation, have abundant grave goods including trade items (copper pendants, copper bangles, copper button, copper tubes, iron fragments, and a glass bead). One individual from Fanning (#14a) exhibiting cranial deformation has unknown associations but has a green stain on the left zygomatic suggesting

the presence of copper pieces. Only two individuals (Fuller #'s 8, 18) not showing cranial deformation have trade associations (#8 has a copper stain on the skull, #18 has copper stained feathers in association - but the cranial remains of these two individuals are fragmentary). The other cranially deformed individual from the Fanning site (#5) has no associated trade goods but did have an owl's head carved in bone interred with it (the artifact is typical of Columbia River cultures). The other cranially deformed individuals from Fuller (#'s 41 and xz) have unknown associations. The association of Euro-american trade items with cranially deformed individuals may suggest a late entry of other cultures (probably from the lower Columbia) into the area, or a separation of classes within the Fuller and Fanning populations (i.e. the wealthy individuals held valuable trade goods, and practiced head deformation).

Provenience

Provenience of burials and artifacts for the sites was not well recorded in the field notes. There are, however, sketches of many burials (stick figures) showing some relative locations, (to each other) and nonspecific locations from various reference points (usually fenceposts, fence lines, and trees which may no longer exist). Figure 3. is a reconstruction of burial locations for the Fanning site and Figures 4, 5, and 6. for the Fuller site (Appendix E). Information for these maps was taken directly from the sketches and text of the field notes. Some of the burial locations are debatable and some impossible to determine. Distances are certainly not precise. Orientation and flexure information was also included, each stick figure drawn similar to its representation in the notes. The maps are to be used with caution but may help in the event future archaeological work is attempted at the sites.

Case Description

Most of the above information on burial attributes was taken from the work of previous researchers (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951). Interestingly, occasional discrepancies were found between the field notes, Laughlin, and Collins regarding burial type, side, orientation, grave type, and association. Differences in assignment of sex and age also occurred. Table 19 (Appendix A) lists all of the information as presented by each researcher, and then attempts to sort out the correct from the erroneous, or suggest a most likely scenario for each individual. This is done in the "Case Description" section of each burial description. In addition, the current disposition of remains and other pertinent information are presented here. Tallies and other information presented in the above descriptions of burial attributes utilize this most likely scenario approach in deciding which information to use when inconsistencies are found. Typically, (in cases where disagreements are found) the Laughlin and Collins information will disagree with each other, but the "correct" answer is confirmed after consultation with the field notes.

General Preservation

Few individuals at either site were well-preserved. Of twenty-two individuals at the Fanning site only two had crania complete enough to do a large number of metric analyses (Fanning #'s 2, 14a). Out of 44 individuals at the Fuller site only 11 crania were complete enough to do at least half of the total 23 measurements attempted. Combined, both sites produced only 11 (eight adult) individual crania complete enough to do a series of the same 12 measurements on each skull. Most crania were fragmentary and those that were intact, had been reconstructed. Reconstruction techniques left a lot to be desired as many skulls had old, non-r eversible glues, clays and tape obscuring some landmarks, covering some sutures, and filling tooth sites, making analysis difficult. In addition, some of the crania had not been glued properly or the glue had warped the skull into a deformed state.

Post-cranial remains have fared even worse. Less attention to reconstruction or original preservation work had been paid the post-cranial remains upon initial recovery. Most were fragmentary when discovered, many others had been broken upon recovery (extensive shovel

damage was apparent), and others have deteriorated since curation. The femur was often the most well-preserved post-cranial element and thus was chosen for metric analyses. A combined 35 individuals provided mid-shaft diameters and circumference of the femur, 29 provided femoral head diameter, and 24 and 23 provided maximum length and in-position lengths respectively. The pelvis was less well-preserved than the femora but was somewhat useful for analysis. Sex estimates from the pelvis were possible on 25 individuals - although often, only a single morphological trait could be studied for each innominate (the sciatic notch and pre-auricular sulcus were the most well-preserved area of the innominates).

Sex

A combined site total of 32 of 66 individuals were assigned a sex estimate based on cranial morphological traits, pelvic traits and /or femoral head diameter including seven individuals from the Fanning site and 25 from the Fuller site (Tables 1 and 2). Sixteen individuals were assessed as male (13 male, 3 male?), while another 16 were assessed as female (15 female, 1 female?). There is a significant difference in the ratio of males and females between the two sites (Table 1, $X^2 = 7.406$, $p = .0065$) Cranial traits were most useful in assigning sex, while pelvic traits helped to assign some sex estimates and confirm others. Femoral head diameter, as originally applied, was found to be somewhat incongruous with the other methods (see below).

The most common and seemingly useful cranial traits include large mastoid processes, large brow ridges and forehead shape (sloping versus high), palate size, and supraorbital ridges. Occasionally, some of those crania estimated as female would have long but slender mastoid processes. In addition, a rugged nuchal area, often thought to be a male trait, occurs on individuals assessed as female.

Pelvic traits most commonly preserved, and therefore most often utilized, include the sciatic notch, and pre-auricular sulcus, with occasional use of the sub-pubic angle, obturator foramen, pelvic inlet shape, and general robusticity. The sciatic notch was typically narrow in males and wide in females. The pre-auricular sulcus often showed as deep and pitted in females, but sometimes shallow. In individuals assessed as male by other traits, a shallow pre-auricular sulcus was still sometimes present.

Table 1. Sex estimate totals by site and percentage of total population.

	Male	Male?	Indeterminate	Female?	Female
Fuller Site	7 (28%)	3 (12%)	19	1 (4%)	14 (56%)
Fanning Site	6 (85.7%)	0	15	0	1 (14.3%)
Total	13 (40.6%)	3 (9.4%)	34	1 (3.1%)	15 (46.9%)

note: Percentages are based on the sample for which sex can be estimated, omitting the indeterminate individuals. Sex is typically estimated for adults only, although some older adolescents are included.

Table 2. Sex estimates from Laughlin and the current assessment.

Burial#	OSMA#	Laughlin	Stepp
FU01		•	
FU02		•	
FU03		F	
FU04	11-154	M	M
FU05	11-155	F / M?	M
FU06		F	
FU07	11-156	F	F
FU08	11-157	M	M
FU09	11-161	F	F
FU10	11-162	F	F
FU11	11-163	F?	
FU12	11-158	F	F
FU13	11-159	F	F
FU14	11-160	M	M
FU15	11-165	F	F
FU16		•	
FU17	11-166	•	
FU18	11-167	•	
FU19	11-168	M	M?
FU20	11-171	M	
FU21	11-170	M	M
FU22		•	
FU23		•	
FU24	11-172	•	M?
FU25	11-173	F	F
FU26	11-175	F	F
FU27	11-176	•	
FU28	11-177	F	F
FU29	11-178	•	
FU30	11-179	M	M
FU31	11-180	M?	F
FU32		•	
FU33	11-181	M	M

Burial#	OSMA#	Laughlin	Stepp
FU34	11-182	F?	F
FU35	11-183	•	F
FU36	11-184	F	F
FU37		•	
FU38		•	
FU39	11-185	F	F?
FU40		M	
FU41	11-186	•	M?
FUxx	11-174	•	
FUxy	11-164	•	F
FUxz	11-169	•	
FA01	11-187	F?	F
FA02	11-188	F	
FA03	11-189	M	M
FA04a	11-190	•	
FA04b	11-191	M	
FA05	11-192	M	
FA06	11-193	M	M
FA07	11-194	F	
FA08	11-195	•	
FA09		•	
FA10		•	
FA11		•	
FA12	11-196	M	M
FA13	11-197	M	M
FA14a	11-198a	•	
FA14b	11-198b	•	
FA14c	11-198c	•	
FA15		•	
FA16		•	
FA17		•	
FA18a	11-199a	•	M
FA18b	11-199b	•	M

note: Laughlin's assessments of sex are taken mostly from Laughlin (1943) but some adjsutments are made from assessments in field notes by Laughlin (Edmundson and Laughlin 1941-42). These consist primarily of adding ?'s to some estimates (he did not use ? in the 1943 paper), and one inconsistency at Fuller #5 which he assessed as female in 1943 paper, but male? in field notes.

Femoral head diameters were utilized when available to assign sex. The method of Pearson (1919, in Bass 1981) was originally applied:

If diameter of femoral head is:	then
< 41.5 mm	Female
41.5 - 43.5 mm	Female?
43.5 - 44.5 mm	unknown
44.5 - 45.5 mm	Male?
> 45.5 mm	Male

This method, however, produced many more females than expected - assessing five individuals as female when they had been assessed as male by other methods (Fanning #18a; Fuller #'s 5, 14, 19, 41; see Table 3). Interestingly, all of these individuals fall in the probable female (female?) category. Only one other female (Fuller #39 assessed as female?) falls in the female? range for femoral head diameter. The mean femoral head diameter for females (from Table 26, Appendix C), judged so by other methods, (not including Fuller #39) is 39.4 mm (s.d. = 1.25, n = 8, left) and 38.9 mm (s.d. = 1.45, n = 10, right). The mean femoral head diameter for males (from Table 26, Appendix C) judged so by other methods but not including the five listed above, is 45.9 mm (s.d. = 2.31, n = 7, left) and 44.5 mm (s.d. = 1.20, n = 6, right). These male means fall within Pearson's range for male (left) and male? (right) and the female means are well below the high value for Pearson's females. This may suggest that Pearson's values for the various categories are too high for this population and should be adjusted downward. Pearson's values were of course calculated from a different population (17th century London).

Table 3. Comparison of sex estimate from Pearson femoral head diameter (mm, left and right sides) and the current sex assignment using all methods.

Burial#	OSMA#	left	right	Pearson estimate	Sex (current)
FU05	11-155	41.6	42.2	Female?	Male
FU07	11-156	38.6	37.5	Female	Female
FU08	11-157	45.5	45.5	Male	Male
FU12	11-158	40.2	39.3	Female	Female
FU13	11-159	38.8	39.6	Female	Female
FU14	11-160	43.2	42.9	Female?	Male
FU15	11-165	39.3	39	Female	Female
FU19	11-168	42.6	•	Female?	Male?
FU20	11-171	40	39.6	Female	indeterminate
FU21	11-170	44.4	45.5	Male?	Male
FU24	11-172	44	43.5	unknown	Male?
FU25	11-173	41.3	41.2	Female	Female
FU26	11-175	40.8	40.9	Female	Female
FU30	11-179	47	•	Male	Male
FU31	11-180	38.9	38	Female	Female
FU33	11-181	44.9	44.1	Male?/unknown	Male
FU36	11-184	37.4	37.3	Female	Female
FU39	11-185	43.3	•	Female?	Female?
FU41	11-186	43	42.5	Female?	Male?
FUxy	11-164	•	39	Female	Female
FA01	11-187	•	37	Female	Female
FA04b	11-191	44	44	unknown	indeterminate
FA06	11-193	50.6		Male	indeterminate
FA07	11-194		41.1	Female	indeterminate
FA18a	11-199a		42.8	Female?	Male
FA18b	11-199b	44.6	45.6	Male?/Male	Male

Notes:
1. see Pearson 1919, in Bass 1981.
2. Only adults are included in the above table except Fuller #19 aged betwen 15-20 years and may not be appropriate for this comparison.

Age at death

Age estimates were derived from dental eruption sequence and dental attrition, state of epiphyseal union, cranial suture closure and in a few individuals from changes in the pubic symphyseal face (McKern and Stewart 1957, Gilbert and McKern 1973). Dental eruption and epiphyseal union provide accurate and tight age range estimates for young individuals (i.e. < 21 years). The pubic symphyseal face provides good estimates of age for adults but could be performed on only a few individuals. Cranial suture closure is much less reliable but was the method employed for aging most of the adults.

Fifty-nine of the 66 individuals (42 of 44 from Fuller, and 17 of 22 from Fanning) were assignable to an age range (Table 4 and Table 19, Appendix A). Ten of these are aged through study of previous research (Edmundson and Laughlin 1941-42, Laughlin 1943, Collins 1951), and are classed only by terms such as "infant," "adolescent," and "aged." These ten (the remains of which were not available for study) were included, trusting the judgment of Edmundson (a medical doctor) and Laughlin (an anthropologist), whose assessment of available individuals is almost always congruent with the current assignment of age.

In order to attempt a demographic breakdown of the population, arbitrary age classes were devised and individuals assigned to those classes based on degree of overlap of the specific individual age range with the general age class. These age classes and number and percent of individuals falling within them are presented in Table 5.

While adult classes are created they are probably not very reliable - most were aged by cranial suture closure and 16 of 33 adults could only be assessed as > 21 years, not placed into classes. The results show, however, that 61.1% of the population is over 20 years of age. Those individuals less than 21 years were more reliably classed and fall into three groups: 0-2 years (n=8, 13.5%), 2-9 years (n=3, 5.1%), and 10-19 years (n=12, 20.3%). It should be noted that differential preservation of age classes may have occurred at the sites - it was apparent that

the youngest individuals were more fragmentary than older individuals. There were no apparent sex correlations with any particular adult age class, both males and females being found in all adult groups. Sex is not estimated for younger individuals. There were no apparent differences between the two sites in percentage of individuals assigned to each age class.

Table 4. Individual age assessments (in years).

Burial#	OSMA#	Age
FU01		adolescent
FU02		adolescent
FU03		adolescent
FU04	11-154	44-50
FU05	11-155	22-35
FU06		aged
FU07	11-156	> 21
FU08	11-157	28-43
FU09	11-161	37-47
FU10	11-162	20-38
FU11	11-163	11-12
FU12	11-158	> 21
FU13	11-159	22-29
FU14	11-160	36-46+
FU15	11-165	22-29
FU16		infant
FU17	11-166	< 2
FU18	11-167	9-12
FU19	11-168	15-20
FU20	11-171	18-20
FU21	11-170	22-29
FU22		infant
FU23		infant
FU24	11-172	22-35
FU25	11-173	22-29
FU26	11-175	26-35
FU27	11-176	9-18 months
FU28	11-177	>21
FU29	11-178	5-12
FU30	11-179	> 21
FU31	11-180	> 21
FU32		infant
FU33	11-181	18-20

Burial#	OSMA#	Age
FU34	11-182	> 21
FU35	11-183	> 21
FU36	11-184	> 21
FU37		none
FU38		none
FU39	11-185	21
FU40		adolescent
FU41	11-186	18-21
FUxx	11-174	> 21
FUxy	11-164	> 20
FUxz	11-169	6-7
FA01	11-187	26-31
FA02	11-188	13-18
FA03	11-189	>21
FA04a	11-190	>21
FA04b	11-191	>21
FA05	11-192	20-21
FA06	11-193	36-46
FA07	11-194	34-40
FA08	11-195	2-10
FA09		infant
FA10		none
FA11		none
FA12	11-196	20-21
FA13	11-197	37-47
FA14a	11-198a	12-14
FA14b	11-198b	>18
FA14c	11-198c	18 mo - 2 yrs
FA15		none
FA16		none
FA17		none
FA18a	11-199a	40-46
FA18b	11-199b	>21

note: See individual burial description for reasoning behind age assignments. Word assignments such as "adolescent" or "infant" are taken from Laughlin (1943, Edmundson and Laughlin 1941-42) when no current assessment can be made. All ages are in years unless otherwise noted.

Table 5. Age class assessments by site and total (number of individuals).

Age Class	Fuller Site	Fanning Site	Total	% of Population
0-2	2 (+4)	1 (+1)	3 (+5)	13.5
2-9	2	1	3	5.1
10-19	6 (+4)	2	8 (+4)	20.3
20-29	8	3	11	18.6
30-39	2	1	3	5.1
40-49	3	3	6	10.2
50+	0	0	0	0
Others > 21	10 (+1)	5	15 (+1)	27.1
unknown	[2]	[5]	[7]	
Totals	42	17	59	

notes: Individuals of unknown age [in brackets] are not included in the totals or calculation of percentages. Numbers in parentheses are from Laughlin (1943, Edmundson and Laughlin 1941-42) and are included in totals - infants were assigned to class 0-2, adolescents to class 10-19, and the aged individual to class others > 21. See Table 4.and Table 19, Appendix A for age class assignments for specific individuals.

These age class divisions are arbitrary and used only as a means to define the population. Age ranges assigned to individuals often overlap these classes - in these cases the individual was assigned to the class in which the greater portion of their range was found.

Individuals over 20 years of age make up 61.1% of the population while those under 20 years account for the rest (38.9%).

Stature

Stature estimates were calculated from femoral lengths (maximum morphological length and in-position length, Table 25, Appendix C) utilizing various formulae (Trotter and Gleser 1958 - formula for mongoloid males; Genoves 1967 - formulae for indigenous Mexican males and females; Neumann and Waldman 1968 - formulae for native American males and females). Each of the various formulae gave a unique mean and range for the samples (Table 6). Twelve of 16 males (male + male?) could be measured for maximum morphological length and provided stature estimates via Trotter and Gleser, and Genoves' formulae, while 10 of 14 males provided in-position lengths and stature estimates by way of Neumann and Waldman's formula. Nine of 16 females (female + female?) provided both maximum morphological length and in-position length and statures by way of Genoves' formula and Neumann and Waldman's formula, respectively (Trotter and Gleser do not provide a formula for mongoloid females). Three of the males were from the Fanning site the rest from Fuller, while only a single female was from Fanning and eight from Fuller. Stature ranged in the males from 1559 mm to 1766 mm, and in the females from 1522 mm to 1619 mm (all methods combined). Stature means ranged from 1636 mm to 1661 mm in males, and from 1547 mm to 1574 in females (Table 6). The male means include values for Fuller #19 an individual assessed as male? and aged only 15-20 years, and Fuller #24 an adult assessed as male?. These two individuals provide the lowest values for stature from the Trotter and Gleser and Genoves formulae and Fuller #24 provides the second lowest value for the Neumann and Waldman estimates (Fuller #19 gave no Neumann and Waldman estimate). When removed from this population, the mean stature estimates for males increases to 1650 mm from 1636 mm (Genoves), to 1663 mm from 1650 mm (Trotter and Gleser), and to 1664 mm from 1661 mm (Neumann and Waldman) - standard deviations also decrease slightly.

Table 6. Estimate of stature for adult males and adult females from femoral lengths (mm).

Males				
Burial #	OSMA #	T&G	Gen	N&W
FU04	11-154	1680	1667	
FU05	11-155	1645	1631	1657
FU08	11-157	1616	1599	1639
FU14	11-160			
FU19	11-168	1577	1559	
FU21	11-170	1637	1622	1655
FU24	11-172	1586	1568	1628
FU30	11-179	1766	1758	1725
FU33	11-181	1618	1602	1626
FU41	11-186	1691	1678	1682
FA03	11-189			
FA06	11-193			
FA12	11-196	1704	1692	1688
FA13	11-197			
FA18a	11-199a	1603	1586	1632
FA18b	11-199b	1677	1664	1676
Total	n	12	12	10
	mean	1650	1636	1661
	s	55.3	58.3	31.9
Fuller	n	9	9	7
	mean	1646	1632	1659
	s	58.9	62	35
Fanning	n	3	3	3
	mean	1661	1647	1665
	s	52.3	54.9	29.5

Females				
Burial #	OSMA #	T&G	Gen	N&W
FU07	11-156		1522	1557
FU09	11-161			
FU10	11-162			
FU12	11-158		1541	1572
FU13	11-159		1527	1558
FU15	11-165			
FU25	11-173		1545	1572
FU26	11-175		1557	1588
FU28	11-177			
FU31	11-180		1532	1566
FU34	11-182			
FU35	11-183			
FU36	11-184			
FU39	11-185		1619	1607
FUxy	11-164		1515	1559
FA01	11-187		1562	1583
Total	n		9	9
	mean		1547	1574
	s		31.3	16.6
Fuller	n		8	8
	mean		1545	1572
	s		32.9	17.3
Fanning	n		1	1
	mean		1562	1583
	s		-	-

notes: Formulae used for stature determination are found in: T&G = Trotter and Gleser (1958), Gen = Genoves (1967), N&W = Neumann and Waldman (1968).

Individuals are mostly adults, but some males are young: Fuller #19 is age 15-20 years, Fuller #33 is 18-20, Fuller #41 is 18-21, and Fanning #12 is 20-21 (all femoral epiphyses are fused for these individuals, but still visible in Fuller #19).

Dental Analyses

Twenty-nine of 49 individuals with remains available for study had all or part of the maxillary dentition present (22/33 at Fuller and 7/16 at Fanning). Also, 29 of 49 individuals had all or part of the mandibular dentition present (22/33 at Fuller and 7/16 at Fanning). The dental remains represent 34 individuals (25 Fuller, 9 Fanning) There are 363 maxillary and 360 mandibular tooth sites present. There are 281 (77.4%) maxillary teeth and 206 (57.2%) mandibular teeth present. Antemortem tooth loss occurred at 30 (8.3%) maxillary, and 76 (21.1%) mandibular tooth sites. Bone resorption occurs at most sites of antemortem loss. Postmortem tooth loss accounted for 52 (14.3%) maxillary and 78 (21.7%) mandibular teeth.

Caries occurs in 27 (5.5%) teeth of the 487 available for inspection. Caries occurs in 12 of the 25 (48%) individuals from Fuller, and 2 of 9 (22.2%) from Fanning. Occlusal caries accounts for 21 (77.8%) of these, mesial caries for one (3.7%), distal caries four (14.8%), and buccal caries one (3.7%). Incidence is split between upper (16 occurrences) and lower (11 occurrences) jaws. Caries most often affects the molars with all rates of occurrence presented in Table 7.

Table 7. Occurence of Caries by Tooth Site, Adult Dentition.

Tooth	# occurrences	percent of total
upper M3	2	7.4
upper M2	5	18.5
upper M1	5	18.5
upper PM2	0	
upper PM1	1	3.7
upper C	2	7.4
upper I2	1	3.7
upper I1	0	
lower I1	0	
lower I2	0	
lower C	0	
lower PM1	0	
lower PM2	2	7.4
lower M1	3	11.1
lower M2	0	
lower M3	6	22.2
	27	100
Total	27	100

Dental abscess occurs in only one individual, Fanning #7, at the sites of the upper left second and third molars.

Two individuals have interesting anomalies. The left upper first premolar of Fanning #12 is rotated 90 degrees in its socket such that the buccal side now points mesially. The lower right canine of Fuller #19 is erupted low on the alveolus and between the two incisors.

Crowding of teeth occurs in three individuals: The lower right incisors and canine of Fuller #19 (see above), the second lower incisors of Fuller #25, and the lower third molars of Fuller #4 have little room.

Markedly shovel-shaped incisors are present in eight (40%) of the 20 individuals with incisors available for study (Fanning #'s 5, 12, Fuller #'s 11, 18, 19, 20, 31, 41). Shoveling occurs in all eight of the individuals in both central and lateral incisors, except for Fuller #41 in which only a central incisor is available for inspection. These individuals all have an attrition score of less than 45. The incisors of seven of the 20 are too worn to confirm as such (attrition level > 60 in central incisors, > 50 in lateral incisors). Three individuals (Fuller #5, #10, #13) exhibit minor shoveling, but have attrition levels between 40 and 60, making degree of shoveling difficult to assess. One individual, Fuller #4, has only a right lateral incisor available for study - it is not shovelled.

Dental attrition was studied in each tooth present. Criteria for assessing dental attrition are presented in Appendix D, but in general a scale from 10 (no wear) to 80 (roots in occlusal plane) was utilized modified from Molnar (1971) and Hall and German (1975). Number of teeth exhibiting the various levels of wear are tallied in Table 8. (maxilla) and Table 9. (mandible), with means and standard deviations calculated for each tooth. All individuals with adult dentition are included in the sample.

In the maxilla, third molars show the least wear - probably due to the later eruption of this tooth and the large number of younger individuals in the sample. Central and lateral incisors, canines and first molars show the greatest wear. Mean attrition levels vary from 24.2 - 50. Mean attrition level for all maxillary teeth is 41.83.

In the mandible, first molars show the greatest wear, followed by lateral and then central incisors. Mean attrition levels vary from 31.4 - 56.3. Mean attrition level for all mandibular teeth is 41.41.

Some deciduous teeth are present in the population. Fuller #xz has all maxillary deciduous teeth present and exhibiting attrition levels between 30 (second molars) and 50-60 (all others). Fuller #18 has two upper molars present both worn at level 60. Fuller #27 has one deciduous incisor present with no wear and one incompletely formed molar. Fanning #14c has a single upper lateral incisor present with no wear.

Table 8. Maxillary dental attrition, number of teeth exhibiting various levels of wear.

Attrition Level	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	Total	mean	s.d
Tooth																		
L molar 3	4		3	2	2				1				1			13	25.3	17.5
L molar 2	1	1	3		6	1	2			4	1	1	1			21	37.9	17.4
L molar 1			1	3			1	3	3	2	1		4			18	48.3	16.5
L premolar 2	2		2	2	3	1	1	1		3	1		2		1	19	40.3	20.9
L premolar 1		1	2	4	2	1	1	1	1	4	1			2	1	21	42.6	19.8
L canine	1		1	3	3	1	2	1	3	1	1		1	1	2	21	44	20.3
L incisor 2				6		1		2	2		2	2		1	1	17	45.9	19.2
L incisor 1				5				1	2	1	1	2	2	1		15	48.7	19.1
R incisor 1				3	1		1	1	2	1	2	1	2		1	15	50	18
R incisor 2				3	2	1	2		2		1	2	1	1		15	45.7	17.7
R canine			1	4	1		3	1	3		2		2	1	1	19	46.3	18.8
R premolar 1	1		2	3	2		3		2		3		2	1		19	42.1	19.6
R premolar 2	1		1	2	4	1	1	2	1	2	1	1	2			19	41.6	17.6
R molar 1			2	2			2	4	2	2			5			19	46.8	19.5
R molar 2	2		2		8		2		1		1		1			17	32.9	15.7
R molar 3	3		4		5					1						13	24.2	12.2
overall	15	2	24	41	39	7	21	17	25	21	18	9	26	8	7	281	41.83	

note : see Appendix D for description of attrition levels.

Table 9. Mandibular dental attrition, number of teeth exhibiting various levels of wear.

Attrition Level	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	Total	mean	s.d
Tooth																		
L molar 3	3		2		5		1		1		1		1			14	31.4	18.3
L molar 2	1		1	1	4	1		2	1		4					15	39.3	16.2
L molar 1				1			1	2	2	2	1	2	3		1	15	56.3	14.3
L premolar 2	2			1	5	1	1	2	1	1		1		1	1	17	35.6	19.4
L premolar 1		1	1	1	3	1	5		1	1	1		1			16	38.8	14.5
L canine				1	4		3	1	2		1		1	1		14	40.4	19.4
L incisor 2					3		2	1	2		2			1		11	46.4	14.5
L incisor 1				1	3			1	3		1					9	41.1	12.4
R incisor 1				1	3			2	1		2					9	41.7	13.5
R incisor 2					2	1	1	1	2		1		1	1		10	43.5	22
R canine	1		1		3	1	1	2	1		1		1			12	38.8	16.7
R premolar 1	1		1	1	4		4			1	2					14	36.4	14.6
R premolar 2	1			1	5	1	1	1		2	1		1			14	38.9	16.2
R molar 1			1	1		1	2	1		1	2		2			11	47.3	17.1
R molar 2	2		1	1	3	2			2	1	1	1	1			15	38.3	19.1
R molar 3	2		1		2	1			1	1			2			10	38	22.4
overall	13	1	9	11	49	10	22	16	20	10	21	4	14	4	2	206	41.41	

note : see Appendix D for description of attrition levels

General Health and Pathological Conditions

The Yamhill population appears to be in general good health. Very few pathologies are noted in the skeletal remains. Most of the individuals, while being relatively short statured (compared to modern populations), are somewhat robust in musculature as evidenced by rugged areas of muscle attachment in the skeletal remains.

Pathologies noted include several individuals with dental caries and one with a large abscess, and several other dental anomalies - these have been previously described in the dental analysis section. Besides dental caries the most common pathological condition is arthritis in various forms. Six individuals exhibit osteoarthritic lipping of the vertebrae. Fanning #4a shows osteoarthritic lipping of the lumbar vertebrae but not in the thoracic, Fanning #7 has osteoarthritic lipping in only one of four lumbar vertebrae present, Fuller #14 exhibits extensive osteoarthritic lipping of all lumbar, thoracic and cervical vertebrae present, arthritic formations in the proximal left humerus and left scapula, and Edmundson notes this individual to suffer from "marked hypertrophicosteo - thin skull arthritis and osteoporosis," Fuller #15 shows osteoarthritic li pping in the single lumbar vertebra present, Fuller #24 exhibits osteoarthritic lipping in all vertebrae present, and Fuller #36 has substantial osteoarthritis in both lumbar vertebrae present and Edmundson notes this individual to have a "marked change in all joints." In addition to these cases, Fuller #10 has the sixth and seventh cervical vertebrae fused across the centrum and spinous process, Fuller #26 has fusion of the left talus and calcaneus, and Fuller #40 has one interphalangeal joint fused - the cause of these conditions is undetermined. All of the individuals with arthritic pathologies are adult, except for Fuller #40, listed by Laughlin as an adolescent. Two of these adults are aged in their late 30's or early 40's, four are aged to be in their 20's or 30's, and two are aged simply as > 21 years. Correlation of arthritic pathologies with age is difficult due to the problematic age classification of adult specimens in this study. Osteoarthritic lipping was not seen in any individual under age 21.

Three individuals have unusual asymmetric bulging of one side of the posterior occipital bone (Fanning #8, Fanning #13, and Fuller #15). Fanning #1 has an unusual depression in the posterior occipital, but this is determined to be only a non-functional anomalous or congenital condition (Holm Neumann, a local orthopedic surgeon and osteologist examined this individual).

Auditory tori, or exostoses, appear in the auditory meatus of three individuals. Fanning #6 has extensive growth of auditory tori in both meatuses, nearly closing the openings. Fuller #4 has a smaller exostosis in the right meatus. Fuller #14 has exostoses in both auditory meatuses.

Fuller #31 was noted by Edmundson to be missing the neural arch from the fifth sacral vertebrae and thus suffering from spina bifida - the condition did not appear to have had a negative effect on the individual's health or functioning.

Cranial Deformation

Nine of 66 individuals exhibited artificial cranial deformation (Fuller #'s 3, 4, 10, 39, 40, 41, xz, and Fanning #'s 5, 14a). All of these were of similar type - that is, obvious pressure had been applied to the posterior of the skull on the occipital bone and opposite pressure on the frontal bone above the orbits (on the forehead). This type of fronto-occipital flattening is reportedly typical of the Chinookan cultures occupying territories to the north of the Kalapuya, along the lower Willamette River, below Willamette Falls, and along the lower Columbia to the coast. It is also reported among the Tualatin Kalapuya, the northernmost Kalapuya, occupying territory adjacent and immediately north of the Yamhill. This type of head deformation, while reported among other Kalapuya groups, was apparently practiced less frequently as one moves south through the Willamette Valley.

Those individuals exhibiting deformation include Fanning #14a, aged 12-14 years. This skull not only shows the typical fronto-occipital deformity, but also a slight asymmetry, with the right occipital bulging more than the left. There are several extra ossicles present in the cranial vault including one in the lambdoid suture lying just right of (adjacent to) the landmark lambda, two small ossicles on the left side lambdoid suture, and two small ossicles on the left coronal suture. This individual was not described by previous researchers, so definite artifact associations are unknown, but a green copper stain on the left malar suggest trade items were interred with this burial.

The crania of Fanning #5 (aged 20-21 years) is, at present, too fragmentary to note deformation, but Laughlin (Edmundson and Laughlin 1941-42) suggested possible occipital deformation which was not confirmed in this study. The individual had no associated trade items, but did have a carved owl's head, in bone, similar to artifacts found along the Columbia River.

Fuller #3, an adolescent, is not currently available for study, but Laughlin (1943, Edmundson and Laughlin 1941-42)) describes the individual as exhibiting frontal flattening. This burial also had copper trade items in association, and a copper stain on the right ulna.

Fuller #4, an adult, manifests fronto-occipital deformation. There is a green copper stain on the anterior maxilla and mandible indicating trade items had been present in the burial (none were found).

Fuller #10, an adult, also is deformed, and has associated copper and glass trade items. There are extra ossicles at lambda and in both sides of the lambdoid suture.

Fuller #39, approximately 21 years old, is fronto-occipitally deformed, and again, has trade item associations. There is a nearly formed Inca bone at lambda, the left superior suture between this extra ossicle and the left parietal is only partially formed (i.e. the two bones are joined). There are also small ossicles on both sides of the lambdoid suture, and at both asterion.

Fuller #40, an adolescent, is not presently available for study, but was noted by Edmundson and Laughlin (1941-42, Laughlin 1943) to have been deformed both frontally and occipitally. Copper and iron trade items were in association with this burial. Cedar planks and other cedar scraps also surrounded the burial, and it was believed by Edmundson to have been a more recent interment than other burials found at the site.

Fuller #41, 18-21 years old, exhibits fronto-occipital deformation with a slight asymmetry, the right side being longer than the left. There are extra ossicles present in both sides of the lambdoid suture, one located adjacent the lambda on the right side and two in the left suture. There is an extra ossicle in the right coronal suture. Grave good associations are unknown.

Finally, Fuller #xz, 6-7 years of age, exhibits fronto-occipital deformation, with a post-depositional asymmetry causing the right temporal and occipital to bulge more than the left. Burial associations are also unknown.

Two of the nine individuals are not available for study (Fuller # 3, 40). Fanning #5 is too fragmentary to be conclusively evaluated. The remaining six are relatively complete.

The cranially deformed individuals differ from non-deformed in frequency of occurrence of extra ossicles in the lambdoid and coronal sutures. Also, a patent posterior condylar canal is less frequent in deformed individuals than in non-deformed. (See the section on non-metric traits for further discussion of these differences). Metric analyses may also be affected, especially with regard to length, breadth and height measurements of the skull (but see the section on craniometric analyses).

Two of the deformed individuals have unknown associations. Six of the remaining seven (85.7%) have trade items associated with them. Only two of forty-eight (4.3%) non-deformed individuals, with known associations have trade items interred with the burial.

Metric Analyses - Craniometrics

Each individual was subjected, where possible, to a series of craniometric analyses. The cranial landmarks, and measurement definitions are presented in Appendix B. The results of these measurements are presented in Appendix C - Table 20 (adult craniometrics), Table 21 (adult cranial indices), Table 22 (non-adult craniometrics), Table 23 (measurements of the maxilla), Table 24 (measurements of the mandible).

Adult craniometric measurement was incomplete, 12 of 39 individuals available for study could not be measured cranially. Ten individuals provided at least half of the 23 cranial measurements attempted, 17 provided less than half. Eight individuals (four males and four females, all from the Fuller site) provided a series of the same 12 measurements, and four indices. Four of these, however, have artificially deformed crania (2 male, 2 female).

Crania exhibiting artificial deformation (nine individuals, five adults) may create some difficulty in determining realistic means for various measurements (McNeil and Newton 1965,). Following standard practice, the craniometric results from deformed individuals will be treated separately and not included in comparative analyses between the sexes or with other populations.

Non-deformed males and females were compared (unpaired, two-tailed t test) for differences in mean for the various cranial measurements (Table 10) and cranial indices (Table 11). Three measurements and one index (cranial module) showed a significant difference in mean ($p < 0.05$). In general these differences represent the greater robusticity of the male crania over the more gracile female.

Cranial metric and index means were compared (unpaired, two-tailed t test) between the two sites. Few of the measurements could actually be tested as the crania from the Fanning site provided a limited number of measurements. None of the measurements showed a

significant difference between the sites ($p = 0.05$). (Note: fronto-parietal index gives $t = 2.072$, $p = 0.0682$. but Fanning provided only a single result for this index, while Fuller provided 10).

The cranial index has a mean brachycranic shape (broad or round-headed) for both females and males. Males ranged, however, from dolichocrany (narrow or long headed) all the way to hyperbrachycrany (very broad). Females ranged from mesocranic to brachycranic. In spite of the range difference, males and females are not significantly different in mean cranial index ($t = 1.192$, $p = 0.2546$). The two deformed males were hyperbrachycranic, the two deformed females mesocranic and brachycranic.

The length-height index shows the population with a relatively high skull compared to its length, only two individuals fall in the orthocranic (medium high) category. Deformed individuals are all hypsicranic.

The breadth-height index showed metriocrany (average height) although several individuals ranged into the acrocranic (high skull) range - the male mean was in fact within the acrocranic range. The deformed individuals were either acrocranic (n=1) or metriocranic (n=2).

Mean height index also shows a relatively high skull with respect to both length and breadth although a few females ranged into the medium category. Deformed individuals bordered the medium and high categories.

Table 10. Male / Female Comparative Craniometric Analysis (unpaired, two-tailed t test).*

	Females			Males			
Measurement	n	mean	s.d.	n	mean	s.d.	t value	probability
max length	7	170.1	4.67	8	178.3	4.71	-3.338	0.0053
max breadth	9	138.7	3.5	10	140.6	6.11	-0.832	0.4167
basion-bregma	4	133	2.94	4	142.5	7.33	-2.407	0.0528
min frontal breadth	6	91.58	2.97	5	94.9	6.15	-1.175	0.27
bizygomatic	3	130.7	3.01	1	131	-	-0.086	0.9391
nasal height	2	47.55	2.33	2	54.4	2.26	-2.98	0.0966
nasal breadth	2	24.25	0.354	4	24.78	3.92	-0.178	0.8671
orbital breadth -L	3	44.16	3.1	2	43.5	5.52	0.18	0.8689
orbital breadth -R	3	45.96	3.23	2	46.8	2.97	-0.29	0.7904
orbital height -L	3	36.8	1.35	1	37.9	-	-0.704	0.5543
orbital height -R	2	34.95	0.636	2	36	2.69	-0.538	0.6446
biorbital breadth	3	96.5	2.6	2	103.3	6.72	-1.672	0.193
basion-porion -L	4	62.85	2.73	5	67.54	4.8	-1.727	0.1278
basion-porion -R	4	64.05	2.161	5	69.02	2.99	-2.777	0.0274
porion-nasion -L	6	110.7	3.47	8	113.4	3.73	-1.391	0.1894
porion-nasion -R	5	110.5	3.35	6	115	4.7	-1.801	0.1052
porion-prosthion -L	2	122.8	3.46	2	12.8	4.81	0.012	0.9916
porion-prosthion -R	2	120.8	3.68	2	122.1	0.141	-0.5	0.669
basion-nasion	4	97.32	3.52	4	107.9	2.03	-5.233	0.002
max frontal breadth	7	114.7	2.98	6	117.8	5.19	-1.355	0.2025
basion-prosthion	1	103	-	2	101.8	1.77	0.577	0.6667
nasion-prosthion	2	66.75	0.212	2	72	3.25	-2.278	0.1504
foramen magnum lngth	4	35	4.03	5	38.28	2.24	-1.56	0.1628

*cranially deformed individuals removed for comparison.

Table 11. Male / Female Comparative Craniometric Analysis - Cranial Indices (unpaired, two-tailed t test).*

	Females			Males			
Index	n	mean	s.d.	n	mean	s.d.	t value	probability
cranial index	7	81.3	2.01	8	78.78	5.26	1.192	0.2546
cranial module	4	146.7	2.68	4	153.6	4.2	-2.775	0.0322
length-height index	4	78.5	2.64	4	80.92	5.28	-0.817	0.4452
breadth-height index	4	96.76	2.21	4	100.4	3.61	-1.726	0.1351
mean height index	4	86.67	2.28	4	89.54	3.89	-1.275	0.2494
fronto-parietal index	6	66.46	1.91	5	66.31	3.63	0.087	0.9323
nasal index	2	51.08	3.25	2	49.23	11.8	0.213	0.851
orbital index left	3	83.59	6.41	0	-	-	np	np
orbital index right	2	75.95	6.06	2	76.9	0.862	-0.219	0.8468
upper facial index	2	50.58	1.25	1	53.21	-	-1.722	0.335

*cranially deformed individuals removed.

The fronto-parietal index indicates a metriometopic (medium) relationship between the frontal and vault breadths although several males and females show a stenometopic (narrow) frontal breadth. The deformed individuals were stenometopic (n=2) and metriometopic (n=1).

The upper facial index indicates a mesenic (medium) height to breadth ratio of the face. Deformed individuals were also mesenic with one leptenic (narrow face) individual.

The nasal index indicates a mesorrhinic (medium) breadth to height ratio of the nasal aperture, although individuals range from narrow to wide. Three of four deformed individuals had narrow nasal apertures, one had a wide nasal aperture.

The orbital index indicates wide orbits for the sample. Deformed individuals all have wide to very wide orbits.

Comparison of male and female means for cranial module indicate an overall size difference between the sexes ($t = -2.775$, $p = .0322$).

Craniometric results were compared to several other known populations including the Gold Hill, Takelma (Cressman 1933a, 1933b, Ferllini 1989), Nightfire Island, Modoc (Sampson 1985), Coquille, (Hall n.d.), and the Lone Ranch, Athapaskan (Berreman 1944). The results of these comparisons are presented in Tables 12, 13, 14, 15.. Differences at $p < 0.05$ were considered significant. Several measurements and indices showed significantly different results. Craniometric results were also compared to the Kalapuya data of Franz Boas (1891, Jantz 1992) and presented in Table 16.

The Gold Hill population was different in cranial length, cranial index, length-height index, mean height index, and orbital index. The Nightfire Island group showed differences only in orbital breadth and orbital index. The Coquille population showed no significantly different results. The Lone Ranch group differed in basion-bregma, and the length-height and breadth-height indices. The Boas data was compiled from living individuals so does not exactly correspond to current measurement. Four measures, however were felt to be similar enough to compare. Significant differences were found between maximum length and Boas' "length of

head", and between maximum breadth and Boas' "breadth of head." No significant difference was found between nasal height and Boas "height of nose," or between bizygomatic and Boas' "breadth of face." Cranial index was calculated for Boas' sample from headbreadth and headlength and was found to be significantly different from the current result. Discussion of these differences is saved for the next chapter. Discussion of problems in combining males and females for comparison is also presented in the next chapter.

Table 12. Craniometric comparison to the Gold Hill Population (Cressman 1933a, 1933b; Ferllini 1989).*

Measurement	Fuller/Fanning			Gold Hill			t value	p
	n	mean	s.d.	n	mean	s.d.		
max length	16	174.4	6	11	180.5	6.7	-2.487	p = .02
max breadth	21	140.4	5.3	13	134.8	6.9	2.67	.20 > p > .10
basion-bregma	8	137.7	7.2	6	127.7	12	1.955	.10 > p > .05
min frontal brdth	11	93.09	4.7	10	93.5	6.2	-0.0037	p > .20
bizygomatic brdth	4	130.8	2.5					
nasal ht.	4	50.98	4.4	3	53.3	3.9	-0.7261	p > .20
nasal brdth	8	24.11	3.1	2	24	0	0.0502	p > .20
orbital brdth	6	44.61	3.4	2	38.5	0.7	2.236	.10 > p > .05
orbital ht.	5	36.36	1	1	36.5	-	-0.1278	p > .20
biorbital brdth	5	99.2	5.3					
basion-porion	9	66.14	3.8					
porion-nasion	14	112.4	4.2					
porion-prosthion	4	122.1	1.4					
basion-nasion	8	102.6	6.3					
max frontal brdth	14	116.5	4.3					
basion-prosthion	3	102.2	1.4					
nasion-prosthion	4	69.38	3.6					
for. magnum lngth	9	36.82	3.4					
Index								
cranial index	16	80.16	4.1	11	74.7	5	3.113	.01 > p > .002
cranial module	8	150.12	4.9	5	146.9	7.2	1.492	.20 > p > .10
length-height	8	79.71	4.1	5	71.44	6.5	2.849	.02 > p > .01
breadth-height	8	98.58	3.4	6	94.46	9.1	1.189	p > .20
mean height index	8	88.1	3.3	5	80.8	7.1	2.544	.05 > p > .02
fronto-parietal	11	66.39	2.6					
nasal index	4	50.16	7.1	2	46.5	3.5	0.6568	p > .20
orbital index	5	78.79	3.7	1	93.6	3.5	-3.669	.05 > p > .02
upper facial index	3	51.46	1.8					

*Fuller/Fanning cranially deformed individuals removed.

Table 13. Craniometric comparison to the Nightfire Island Population (Sampson 1985).*

Measurement	Fuller/Fanning			Nightfire Island			t value	p
	n	mean	s.d.	n	mean	s.d.		
max length	16	174.4	6	8	175.9	7.5	-0.5218	p > .20
max breadth	21	140.4	5.3	7	137.4	5.8	1.273	p > .20
basion-bregma	8	137.7	7.2	5	135.6	8.2	0.4616	p > .20
min frontal brdth	11	93.09	4.7	7	94.57	5.7	-0.1933	p > .20
bizygomatic brdth	4	130.8	2.5					
nasal ht.	4	50.98	4.4	5	49.6	2.9	0.5681	p > .20
nasal brdth	8	24.11	3.1	5	24.2	1.6	0.076	p > .20
orbital brdth	6	44.61	3.4	5	39.4	2.1	4.395	.002 > p > .001
orbital ht.	5	36.36	1	5	34.8	1.6	1.848	p = .10
biorbital brdth	5	99.2	5.3	4	96	2.4	1.1034	p > .20
basion-porion	9	66.14	3.8					
porion-nasion	14	112.4	4.2					
porion-prosthion	4	122.1	1.4					
basion-nasion	8	102.6	6.3					
max frontal brdth	14	116.5	4.3					
basion-prosthion	3	102.2	1.4					
nasion-prosthion	4	69.38	3.6					
for. magnum lngth	9	36.82	3.4					
Index								
cranial index	16	80.16	4.1	7	78.54	1.4	1.011	p > .20
cranial module	8	150.12	4.9	4	150.83	7.1	-0.2031	p > .20
length-height	8	79.71	4.1	5	76.08	1.9	1.848	.10 > p > .05
breadth-height	8	98.58	3.4	4	96.55	4.2	0.9086	p > .20
mean height index	8	88.1	3.3	4	85.2	2.9	1.48	.20 > p > .10
fronto-parietal	11	66.39	2.6					
nasal index	4	50.16	7.1	5	48.78	1.3	1.023	p >.20
orbital index	5	78.79	3.7	5	88.36	2.6	-4.745	.002 > p > .001
upper facial index	3	51.46	1.8					

*Fuller/Fanning cranially deformed individuals are removed.

Table 14. Craniometric comparison to the Coquille Population (Hall n.d.).*

Measurement	Fuller/Fanning			Coquille			t value	p
	n	mean	s.d.	n	mean	s.d.		
max length	16	174.4	6	6	181	14	-1.615	.20 > p > .10
max breadth	21	140.4	5.3	4	139	4	0.5004	p > .20
basion-bregma	8	137.7	7.2	4	137	14	0.1253	p > .20
min frontal brdth	11	93.09	4.7	7	95	4	-0.8809	p > .20
bizygomatic brdth	4	130.8	2.5	3	132	18	-0.139	p > .20
nasal ht.	4	50.98	4.4	5	53	5	-0.9509	p > .20
nasal brdth	8	24.11	3.1	6	25	1	-0.6748	p > .20
orbital brdth	6	44.61	3.4	5	43	5	0.6365	p > .20
orbital ht.	5	36.36	1	5	38	3	-1.16	p > .20
biorbital brdth	5	99.2	5.3	4	98	6	0.3182	p > .20
basion-porion	9	66.14	3.8	4	62	3	2.037	.10 > p > .05
porion-nasion	14	112.4	4.2	5	112	4	0.1867	p > .20
porion-prosthion	4	122.1	1.4	4	120	4	1.0093	p > .20
basion-nasion	8	102.6	6.3	3	101	4	0.4138	p > .20
max frontal brdth	14	116.5	4.3	4	112	2	1.994	.10 > p > .05
basion-prosthion	3	102.2	1.4	2	99	6	0.9483	p > .20
nasion-prosthion	4	69.38	3.6	5	71	5	-0.5451	p > .20
for. magnum lngth	9	36.82	3.4	4	35	3	0.9191	p > .20
Index								
cranial index	16	80.16	4.1	4	78	4	0.9482	p > .20
cranial module	8	150.12	4.9					
length-height	8	79.71	4.1					
breadth-height	8	98.58	3.4					
mean height index	8	88.1	3.3					
fronto-parietal	11	66.39	2.6					
nasal index	4	50.16	7.1	5	46	5	1.031	p > .20
orbital index	5	78.79	3.7					
upper facial index	3	51.46	1.8					

*Fuller/Fanning cranially deformed individuals removed.

Table 15. Craniometric comparison to the Lone Ranch Population (Berreman 1944).*

Measurement	Fuller/Fanning			Lone Ranch			t value	p
	n	mean	s.d.	n	mean	s.d.		
max length	16	174.4	6	19	177.6	4.8	-1.761	.10 > p > .05
max breadth	21	140.4	5.3	19	141.9	5	-0.9939	p > .20
basion-bregma	8	137.7	7.2	16	126.7	5.3	4.262	.001 > p
min frontal brdth	11	93.09	4.7					
bizygomatic brdth	4	130.8	2.5	16	135.2	6.3	-1.356	.20 > p > .10
nasal ht.	4	50.98	4.4	14	49.6	1.9	0.9495	p > .20
nasal brdth	8	24.11	3.1	15	24.2	2	-0.0815	p > .20
orbital brdth	6	44.61	3.4					
orbital ht.	5	36.36	1					
biorbital brdth	5	99.2	5.3					
basion-porion	9	66.14	3.8					
porion-nasion	14	112.4	4.2					
porion-prosthion	4	122.1	1.4					
basion-nasion	8	102.6	6.3	15	99.2	4.2	1.574	.20 > p > .10
max frontal brdth	14	116.5	4.3					
basion-prosthion	3	102.2	1.4					
nasion-prosthion	4	69.38	3.6	14	69.5	3	-0.0707	p > .20
for. magnum lngth	9	36.82	3.4					
Index								
cranial index	16	80.16	4.1	19	79.9	2.5	0.2348	p > .20
cranial module	8	150.12	4.9	16	148.8	4	0.7087	p > .20
length-height	8	79.71	4.1	16	71.31	3.2	5.539	.001 > p
breadth-height	8	98.58	3.4	16	89.14	3.7	6.049	.001 > p
mean height index	8	88.1	3.3					
fronto-parietal	11	66.39	2.6					
nasal index	4	50.16	7.1	14	48.9	3.5	0.5018	p > .20
orbital index	5	78.79	3.7					
upper facial index	3	51.46	1.8	14	51.1	2.4	0.2408	p > .20

*Fuller/Fanning cranially deformed individuals are removed.

Table 16. Craniometric Comparison to the Boas Kalapuya Sample.*

Measurement	Fuller/Fanning			Boas			t value	probability
	n	mean	s.d.	n	mean	s.d.		
max length	16	174.4	6	19	182.5	10	-2.835	.01 > p > .002
max breadth	21	140.4	5.3	19	157.1	6.4	-9.017	p < .001
basion-bregma	8	137.7	7.2					
min frontal brdth	11	93.09	4.7					
bizygomatic brdth	4	130.8	2.5	19	135.3	6.1	-1.429	.20 > p > .10
nasal ht.	4	50.98	4.4	19	52.8	4	-0.815	p > .20
nasal brdth	8	24.11	3.1					
orbital brdth	6	44.61	3.4					
orbital ht.	5	36.36	1					
biorbital brdth	5	99.2	5.3					
basion-porion	9	66.14	3.8					
porion-nasion	14	112.4	4.2					
porion-prosthion	4	122.1	1.4					
basion-nasion	8	102.6	6.3					
max frontal brdth	14	116.5	4.3					
basion-prosthion	3	102.2	1.4					
nasion-prosthion	4	69.38	3.6					
for. magnum lngth	9	36.82	3.4					
Index								
cranial index	16	80.16	4.1	19	86.4	6.5	-3.32	.002 > p > .001
cranial module	8	150.12	4.9					
length-height	8	79.71	4.1					
breadth-height	8	98.58	3.4					
mean height index	8	88.1	3.3					
fronto-parietal	11	66.39	2.6					
nasal index	4	50.16	7.1					
orbital index	5	78.79	3.7					
upper facial index	3	51.46	1.8					

*note: Only the above four measurements from Boas are somewhat equivalent to the current skeletal measurement. Boas refers to maximum length as "length of head", maximum breadth as "breadth of head", bizygomatic as "breadth of face", and nasal height as "height of nose." Cranial index is calculated for Boas as headbreadth divided by headlength x 100. It is also noted that Boas' numbers include flesh, skin, and hair, and may not be appropriate to compare (no correction is made for this discrepancy). Fuller/Fanning cranially deformed individuals removed. Also see Jantz et. al. (1992).

Non-metric Cranial Variation

Crania were subjected to a series of non-metric trait (epigenetic variation) assessments wherever possible. Traits were defined (see Appendix B), analyzed and scored as either positive, negative or indeterminate. Incidence of occurrence (number of positive scores) for each trait is summarized in Table 17. While these traits are often discussed as "rare" or as "minor morphological variants," some of them have relatively high rates of occurrence in some populations (Berry and Berry 1967, Saunders 1989). The Yamhill population is no exception. Highest nuchal lines are present in 80% of the sample, high rates for this trait being typical of native American populations (Berry and Berry 1967). Accessory lesser palatine foramina were present in 95.2 % of the sample. The mastoid foramen was exsutural in 68.6% of the sample. Parietal foramina were present in 39.1% of the sample. The anterior condylar canal was double in 21.1% of the sample. Supraorbital foramina were complete in 32.7% and a frontal notch or foramina was present in 41.5% of the sample. Other traits showed lesser rates of occurrence.

Extra ossicles were common at some sites including lambdoid ossicles (35.5%), ossicle at lambda (25%), and ossicles at asterion (29.3%). Interestingly, cranially deformed individuals show a higher rate of occurrence of extra ossicles in the lambdoid and coronal sutures than does the non-deformed sample. Lambdoid ossicles are present at 66.67% (n = 12) of sites in the deformed individuals, but only 25.58% (n = 43) of sites in the non-deformed sample (X^2 = 5.305, p = .0213). Coronal ossicles are present at 20% (n = 10) of sites in the deformed sub-population, and never seen (n = 45) in the non-deformed individuals (X^2 = 4.504, p = .0338).

The trait, posterior condylar canal patent, also showed a difference between deformed individuals (16.67% of sites, n = 6) and the non-deformed (90.48% of sites, n = 21) sample (X^2 = 9.674, p = .0019). No significant differences were seen for the other traits. Table 17 includes

all individuals, from both sites, deformed and non-deformed, in calculation of frequencies of trait occurrence.

Non-metric trait variation was compared between males and females. No traits showed significant differences in frequency of occurrence.

Non-metric trait variation was also compared between the Fuller and Fanning sites. Two traits showed significant differences. Lambdoid ossicles were present in 45.71% (n = 35) of sites in the Fuller sample, but only 15.0% (n = 20) of sites in the Fanning group (X^2 = 4.038, p = .0445). The mastoid foramen was exsutural in 77.78% (n = 27) of sites from Fuller, and only 37.5% (n = 8) of sites from Fanning (X^2 = 2.965, p = .0851).

Incidence of non-metric variants was compared (chi-square frequency analysis with continuity correction) between the Fuller and Fanning combined sample to the Gold Hill, Takelma (Cressman 1933a, 1933b, Ferllini 1989). (The other populations did not enough have non-metric variant assessments to make comparison worthwhile). Differences were considered significant at $p < 0.05$. The results of the comparison are presented in Table 18.

The Gold Hill sample proved different in frequency of several traits including presence of highest nuchal line, lambdoid ossicles, ossicle at asterion, presence of auditory torus, and exsutural mastoid foramina.

Table 17. Incidence of Non-Metric Cranial Traits.

Trait	n	#positive	percent
1. highest nuchal line present	65	52	80
2. ossicle at lambda	32	8	25
3. lambdoid ossicle present	55	19	35.5
4. parietal foramen present	64	25	39.1
5. bregmatic bone present	29	0	0
6. metopism	33	0	0
7. coronal ossicle present	55	2	3.6
8. epipteric bone present	38	1	2.6
9. fronto-temporal articulation	37	0	0
10. parietal notch bone present	49	4	8.2
11. ossicle at asterion	41	12	29.3
12. sagittal bones present	29	1	3.4
13. auditory torus present	68	3	4.4
14. foramen of Huschke present	34	3	8.8
15. mastoid foramen exsutural	35	24	68.6
16. mastoid foramen absent	35	3	8.6
17. posterior condylar canal patent	27	20	74
18. condylar facet double	35	1	2.9
19. precondylar tubercle present	33	0	0
20. anterior condylar canal double	38	8	21.1
21. foramen ovale incomplete	22	1	4.5
22. foramen spinosum open	22	1	4.5
23. accessory lesser palatine foramen present	21	20	95.2
24. palatine torus present	9	6	66.7
25. maxillary torus present	38	2	5.3
26. zygomatico-facial foramen absent	36	5	13.9
27. supra-orbital foramen complete	55	18	32.7
28. frontal notch or foramen present	53	22	41.5
29. anterior ethmoid foramen exsutural	4	2	50
30. posterior ethmoid foramen absent	4	0	0
31. accessory infraorbital foramen present	25	3	12

Table 18. Comparison of Non-metric Trait Frequencies to Gold Hill Population (Cressman 1933a, 1933b, Ferllini 1989).

Trait	Fuller/Fanning		Gold Hill		chi-square	p
	positive	%	positive	%		
1. highest nuchal line present	52/65	80	2/16	12.5	23.375	0.0001
2. ossicle at lambda	8/32	25	5/16	31.3	0.013	0.9086
3. lambdoid ossicle present	19/55	35.5	12/17	70.6	5.489	0.0191
4. parietal foramen present	25/64	39.1	8/28	28.6	0.532	0.4659
5. bregmatic bone present	0/29	0	0/15	0	-	-
6. metopism	0/33	0	1/16	6.3	0.14	0.7086
7. coronal ossicle present	2/55	3.6	3/15	20	2.611	0.1061
8. epipteric bone present	1/38	2.6	0/23	0	0.065	0.7981
9. fronto-temporal articulation	0/37	0	0/22	0	-	-
10. parietal notch bone present	4/49	8.2	8/30	26.7	3.613	0.0573
11. ossicle at asterion	12/41	29.3	1/22	4.6	3.941	0.0471
12. sagittal bones present	1/29	3.4	-		-	-
13. auditory torus present	3/68	4.4	5/17	29.4	7.253	0.0071
14. foramen of Huschke present	3/34	8.8	-		-	-
15. mastoid foramen exsutural	24/35	68.6	7/21	33.3	5.246	0.022
16. mastoid foramen absent	3/35	8.6	4/16	25	1.308	0.2528
17. posterior condylar canal patent	20/27	74	6/10	60	0.182	0.6695
18. condylar facet double	1/35	2.9	0/9	0	0.549	0.4587
19. precondylar tubercle present	0/33	0	-		-	-
20. anterior condylar canal double	8/38	21.1	3/12	25	0.013	0.9109
21. foramen ovale incomplete	1/22	4.5	-		-	-
22. foramen spinosum open	1/22	4.5	-		-	-
23. accessory lesser palatine foramen pr.	20/21	95.2	8/11	72.7	1.603	0.2055
24. palatine torus present	6/9	66.7	7/13	53.8	0.026	0.8726
25. maxillary torus present	2/38	5.3	0/25	0	0.186	0.6662
26. zygomatico-facial foramen absent	5/36	13.9	-		-	-
27. supra-orbital foramen complete	18/55	32.7	8/20	40	0.097	0.7559
28. frontal notch or foramen present	22/53	41.5	9/22	40.9	0.044	0.8341
29. anterior ethmoid foramen exsutural	2/4	50	0/2	0	0.094	0.7595
30. posterior ethmoid foramen absent	0/4	0	-		-	-
31. accessory infraorbital foramen pres.	3/25	12	2/9	22	0.038	0.8464

Metric Analyses - Post-Cranial

Post-cranial metric analyses are summarized in Appendix C, Table 25 (femoral lengths), Table 26 (other femoral measurements), and Table 27 (measurements of the innominates). Measurement of the femora and innominates only was completed. Femoral lengths were useful in estimation of stature, as previously discussed. Femoral head diameter was useful in estimating sex, as previously discussed. Time constraints did not permit a more comprehensive examination of post-cranial elements. Further analysis of post-cranial metrics is not discussed pending completion of further measurement. While post-cranial remains are fragmentary, some metric analysis of long bones is possible and recommended.

Chapter 6
Discussion

This study presents the results of a descriptive analysis of the human remains excavated from the Fuller and Fanning Mound sites excavated in 1941-42 by W. T. Edmundson and William S. Laughlin. Laughlin completed an initial analysis of the materials soon after excavation (Laughlin 1943). The remains have been curated at the Oregon State Museum of Anthropology in Eugene for most of the period since recovery without further study.

Sixty-six individuals are represented by the remains, with a few extra elements inter-mixed with various individuals. The literature (Laughlin 1943, Collins 1951) and original field notes (Edmundson and Laughlin 1941-42) have been analyzed, and a description of burial type, side, orientation, grave type, associations, original preservation, and other information has been compiled for each individual (Table 19, Appendix A). A tally of each of these burial attributes for the Yamhill population as a whole is also completed. In addition, an assessment of age, sex, and stature, a series of craniometric measurements, and non-metric traits, a dental analysis, and general description of obvious pathologic and morphologic condition of each individual and the group as a whole has been accomplished. The results are summarized and discussed below.

The Burials

Jacobs et. al. (1945) information that the dead were typically buried in the ground is upheld by the skeletal population at the Yamhill sites. Edmundson did find one fragment of a burned human skull, but this one piece of evidence was not demonstrated to be from an actual cremation. Jacobs et. al. (1945) also reports that individuals of wealth were often buried with material goods, including ceremonial clothing, baskets, tools, and numerous beads of shell and bone, and other ornamental pieces. The findings at Fanning and especially the Fuller site support the ethnographic literature. Individuals at the Fuller site were often buried with many

beads of shell, bone and occasionally glass and copper. Ornamental pieces (e.g. the decorated whalebone clubs, the owl's head carving) were also found in burials at both sites. Individuals at both sites were found with tools (groundstone and chipped stone, bone and antler), often "killed" or broken as is suggested in the literature (Jacobs et. al. 1945, Laughlin 1941, 1943, Collins 1951). There were individuals buried without association, as is suggested by Jacobs et. al. (1945) for the poor. Cranially deformed individuals often had abundant grave goods and were typically (with two exceptions) the only individuals to have trade items associated. Explanations proposed for this association include a late arrival of cranial deformation into the region, concurrent with the arrival of Europeans, and the possibility that these burials are intrusive into an earlier occupation of the sites (Laughlin 1943). Alternatively, traded items may have been considered of high value and thus concentrated in the hands of the wealthy (Woodward et. al. 1975). If the latter, then it may be suggested that only the wealthy practiced head deformation - although several burials without deformation or trade items still contained an abundance of wealth.

Other conclusions on burial attributes from the excavations are that there was no preference for orientation in the interment of "flexed" individuals, lying on either side. Grave types were typically pits, dug into the softer mound soils, but sometimes intrusive into the deeper clay soils below the cultural midden. A few individuals were found associated with fragments of cedar bark and wood, and in one case a cedar plank. This is suggestive of occasional use of grave boxes, or at least a wood plank lined pit.

Berreman (1944) found most burial flexed or half-flexed, lying on their back or one side, and most oriented in a north-south direction when he excavated at the Lone Ranch site along the southern Oregon coast (an Athapaskan population). Grave goods were often in abundance. He also noted two burials with planks on top and along the sides of the remains. Cressman (1933a, 1933b), digging at Gold Hill (a Takelma population, Penutian language) in interior southwestern Oregon also found abundant grave goods, with mostly flexed burials,

lying on their left side, and head toward the south and facing west. The large ceremonial obsidian blade found with one of the Fuller burials matches those found in abundance with the Gold Hill burials. Another Penutian-speaking group, the Modoc, was excavated at Nightfire Island and reported on by Sampson (1985). These individuals were also typically flexed, lying on the side or back, with various orientation. Grave goods were common. These burials were also cremations and many showed evidence of violent death.

Grave goods at the Yamhill sites possibly provide the most revealing evidence of contact with other cultures. Laughlin (1943) reports the decorated stone mortar, carved bone head, ear plugs, and camas digger handles as influences from the Columbia River and Plateau cultures, and the obsidian blade as a northern extension of the Takelma excavated at Gold Hill. Both the lower Columbian (Chinookan) and the Takelma are Penutian speaking populations and possible distant relations of the Kalapuya. Long-term cultural ties to both regions are possible.

The Population

The combined population yielded an equal number of adult males and females (including 13 males, 3 male?, 1 female?, 15 females and 34 of indeterminate sex), but the sites considered alone were significantly disproportionate in number of males and females (X^2 = 7.406, p = .0065). The Fuller site consisted of 60% female and 40% male, while the Fanning group was 85.7% male and 14.3% female (only one definite female was described in the Fanning remains). While the 60/40 sex ratio at Fuller is close to what might be expected, one wonders whether the large number of males at Fanning is simply an effect of small sample size. Alternatively, it could be indicative of some other trend. Perhaps for at least some time the Fanning site was a male specific task site (the artifacts do not suggest this), a male specific burial site, or adult males died at a greater rate here from disease or other cause (no violent

death is suggested in the skeletal remains), or males preserved better in the skeletal population (no reason to explain this, however).

Individuals in the combined population were distributed over all age classes from 0-49 years (see Table 4 and Table 5). No individuals were classed over 50 years of age. The modal age of the combined population is approximately 20-21 years, while a crude calculated mean for the population is also about 20 years. These are similar to mean ages calculated for other prehistoric populations including those at Hesquiat Harbor, Vancouver Island (mean age = 21.6 yrs, Cybulski 1978), at Point of Pines, Arizona (mean age = 23.7 yrs., Bennett, 1973) and at Dickson Mounds, Illinois (means age 23.8 yrs, Blakely 1971). (Age classes are not well-defined enough for other known Oregon populations to compare.) Mortality by age class, however, appears slightly different from these other known populations. At Point of Pines, Dickson Mound, and Hesquiat Harbor, mortality rates (reflected by percent age distribution) for those aged 0-9 years are 33.9, 35.3 and 38.0 years, respectively (after Cybulski 1978, Table 14, pg 57; Bennett 1973; Blakely 1971). The combined Fuller and Fanning 0-9 year olds only represent 18.6% of the skeletal population (73% of this group dies before age 2 at Fuller and Fanning). The Point of Pines, Dickson Mounds, and Hesquiat Harbor 10-19 year age class represents 6.2%, 9.6%, and 8.3% of their respective skeletal populations, while at Fuller and Fanning this age class represents 20.3% of the population. It would appear, at Fuller and Fanning that there is a high infant mortality, slowed somewhat between ages 2-9 and then increased again at adolescence. Adult mortality patterns at Fuller and Fanning are not discussed, as the method of aging (cranial suture closure) is somewhat questionable. Adults do, however, make up 61.1% of the skeletal population - although poorer preservation of younger individuals may account for a slightly inflated value here. Maximum individual age for the Fuller and Fanning populations appears to be about 50 years.

Stature

Stature estimates indicate a short statured population relative to modern groups. However, comparison to other native samples suggest an average sized group was present at the Yamhill River. Stature estimates ranged from 1636 mm to 1661 mm for the males (5' 5" to 5' 6") and 1547 mm to 1574 mm for females (5' 2" to 5' 3").

Boas (1891, Jantz et. al. 1992) took a "height standing" of four Yamhill males and another group whose tribe is given as "Callapooya" that included 10 males and 5 females. Mean height for the 14 males was 1627 mm (s.d. = 62.2) with a range of 1516 mm to 1723 mm (5' to 5' 9"). Mean height for the 5 females was 1509 mm (s.d. = 74.2) with a range of 1396 mm to 1603 mm (4' 8" to 5' 4"). The Boas male mean is not significantly different from the highest Fuller/Fanning male mean ($t = 1.58$, $.20 > p > .10$). The Boas female mean is problematical. When compared with the greater of the two Fuller/Fanning female means, a significant difference is found ($t = 2.594$, $.05 > p > .02$) but when compared with the lesser of the female means the difference is not statistically significant ($t = 1.365$, $p = .20$). It is noted, however, that Boas data is from living individuals and the Fuller/Fanning results are, of course, estimates from skele tal data. No correction is attempted for this discrepancy, but the suggestion is made that there either is no difference, or only a small decrease in height is seen. These findings are in keeping with Hall (1993), whose study of Boas' 1890's data, reveals that British Columbain and Californian populations increased in size during the 19th century, but native populations in Oregon and Washington maintained uniform size throughout this time period, and thus should be representative of the pre-contact peoples. Hall (1993) attributes this maintenance of size to the later arrival of disruptive forces in Oregon and Washington. A slight decrease in stature (in females) may actually indicate physiological stress due to Euro-American contact, disease and removal to reservations.

Hall (n.d.), studying skeletal remains from the Coquille River area on the central Oregon coast, found a mean stature estimate for females of 1530 mm (n=3, range 1500-1560mm) and of males 1610 mm (n=4, range 1580-1650mm). Her population consists of either Penutians, Athapaskans or a mixed group from the Coquille River estuary. Comparison of means again show some problem. The high Fuller/Fanning male mean is significantly different from the Coquille male mean ($t = 2.64$, $0.05 > p > .02$), but the lower Fuller/Fanning mean is not different ($t = .842$, $p > .20$). The high Fuller/Fanning female mean is also significantly different ($t = 3.30$, $.01 > p > .002$), while the lower Fuller/Fanning female mean is not different ($t = .82$. $p > .20$). If anything, the Yamhill sample is slightly taller than the Coquille.

Health and Pathology

Skeletal remains in general indicate a healthy population. Few pathologies are present, and stature estimates show an average sized population in comparison to other northwest groups. Ethnographic and environmental evidence suggests a well rounded diet (both vegetable and animal) was available and utilized.

It might have been expected that if these sites do in fact date to post-European contact times that infectious disease pathologies related to the several documented epidemics would have been visible in the skeletal populations. This was, however, not the case and may substantiate a body of literature suggesting that the various infectious diseases kill before leaving skeletal pathological evidence (Ortner 1992, Ortner et. al. 1992, Saul and Saul 1989). One must also wonder if the high mortality rate of adolescents relates in some to way to disease. It is also possible the sites pre-date the onset of disease by a few years.

Pathologies present in the population are those expected. Degenerative bone diseases manifested in the form of osteoarthritic lipping of the vertebrae, and in some of the post-cranial joints are similar to those listed for other prehistoric populations in the northwest (e.g. Hall,

n.d., Cybulski 1973, Hemphill 1992a, b, c). These arthritic pathologies, with one exception, occur only in adult individuals. Direct correlation with age could not be made, however, due to the problematic age classification of adults. Auditory exostoses also occur in a few individuals. Spina bifida is reported for a single individual by Edmundson (Edmundson and Laughlin 1941-42). A few individuals have unexplained cranial asymmetries in which the posterior occipital bulges slightly on one side.

Dental analyses revealed some interesting conclusions. Caries occurred in only 5.5% of the teeth studied, but this was enough to account for nearly half of the individuals studied (41% of combined population). Hall, Morrow and Clarke (1986), in their study of prehistoric Oregon dental pathologies, also found a high rate of caries in the Willamette Valley (43%) compared to rates of 6% (lower Columbia), 16% (central Oregon and coastal Oregon) and 33% (Klamath Basin). Hall et. al. (1986) also found the lowest level of attrition in Willamette Valley teeth compared to the other areas. Mean attrition level for all Willamette Valley teeth in their study was 38.7 compared to 41.6 in the Yamhill dentition. They attributed the higher incidence of caries and lowered attrition levels to a diet of softer foods (heavier reliance on plants and carbohydrates), and possibly soil chemistry. Antemortem tooth loss in Hall et. al. (1986) occurs in 43% of Willamette Valley individuals, while this study found a rate of 58.8% of Yamhill individuals with antemortem tooth loss. It is likely that lowered attrition levels are related to increased caries and pathological tooth loss (Hall et. al. 1986). The ethnographic literature on subsistence for the Kalapuya certainly suggests the availability of numerous plant resources. The demonstrated pattern of dental attrition and caries may indicate heavier reliance on these plants than on animal food sources.

Metric Analysis

The average skull shape is brachycranic, hypsicranic, metriocranic, metriometopic and with a mesorrhinic, chamaeconchic and mesenic face (i.e. a broad or round skull, high in relation to length and medium height in relation to breadth, average frontal breadth in relation to vault breadth, average height to breadth ratio of face, medium breadth to height of nasal aperture, and wide orbits). Male and female skulls are of similar shape.

Comparison of male and female means for the various metric traits (Tables 10 and 11) shows some significant differences ($p < 0.05$). These differences in general appear to represent size and robusticity dimorphism between the sexes. The cranial module, which assigns a relative value for the size of the cranial vault, is different, males being larger than females. Measurements of the vault showing a significant difference include maximum length, basion-bregma ($p = .053$), basion-porion (right side), and basion-nasion. In general, then, the male skull has a greater size with respect to length and height, and size of the basal skull (as indicated by the measurements from basion).

Metric Comparison to other Populations

Comparison of metric results of the Kalapuya with other known regional populations provided some interesting results (Tables 12, 13, 14, 15, 16). It was expected that the Kalapuya may show the most similarities with the other Penutian-speaking groups, namely the Gold Hill, Takelma and the Nightfire Island, Modoc. Less similarity was expected with the coastal Athapaskans from Lone Ranch. The potentially mixed group, the Coquille, might show intermediate similarity. The Boas sample was expected to be representative of the Yamhill group. None of the comparisons or statements made are intended to suggest genetic relationships or lineages in the strictest sense - comparison of single continuous (metric) traits are simply not powerful enough to make strong inference for population separations. Single

trait differences may be, however, suggestive indicators for further study utilizing multivariate techniques, and the following statements are intended in that light (see e.g. Rightmire 1969, 1972, Howells 1973). In addition, adult males, females and those of unidentified sex were combined into one group for comparison in order to increase sample size and the number of measurements that could be compared. With larger samples, future comparative studies should separate the sexes (see more below).

Ferllini (1989), in her comparison of the Gold Hill and Nightfire Island populations found no significant metric differences (at $p < 0.05$) between the two groups (note: she used $p < 0.20$ as level of significance, and did find difference between cranial length, nasal height, cranial index, length-height index, and orbital index). The Yamhill population, however, produced several differences between itself and the Gold Hill sample, but only differed with the Nightfire Island series in one area. When compared with the Gold Hill group significant differences were seen in the measures of maximum cranial length, and in the cranial index, length-height index, mean height index, and orbital index (Table 12). When compared with the Nightfire Island group, the only difference seen is in orbital breadth and orbital index (Table 13). The Modoc sample then, varied less from the Yamhill than did the Gold Hill sample in this study, but Modoc and Gold Hill are demonstrated to not be widely divergent (Ferllini 1989).

It does not seem likely that the Yamhill population had closer biological ties with the Modoc than with the Takelma due to the greater distance between territories - although a route across the Cascades through Molalla and Klamath territory may have provided access to the Modoc. It is possible that little gene flow occurred between any of the groups and that the Takelma simply have diverged farther from an original ancestry. Separation in time is also a possible explanation for the difference in metric result. The Gold Hill site is probably older than the Yamhill and Nightfire Island sites (Cressman 1933a, 1933b, Sampson 1985, Laughlin 1943). Trade between or through the Willamette Valley and groups to the south is known from the ethnographic and archaeological literature (e.g. Sapir 1907, Gray 1985, Cressman 1933a,

1933b, Murdy and Wentz 1975, Woodward, et. al. 1975) and included the movement of obsidian tools (ref. the large blade from the Fuller site) from the south, and the transport of *Dentalium* from the north (Vancouver Island). Cultural contact is known to have occurred, but effects on the biological population are unknown.

Comparison of metric traits to the coastal Athapaskan group from Lone Ranch (Berreman 1944) and the potentially mixed group from the Coquille estuary (Hall n.d.) also revealed interesting results. The Coquille population did not differ in any measurement or index (Table 14). The Lone Ranch sample differed in basion-bregma height, and the length-height and breadth-height indices (Table 15). Contact with coastal cultures included both exchange of material items and slaves (Zenk 1976, Minor et.al. 1980). The date of occupation of the Lone Ranch site and the general time frame for the Coquille individuals is probably contemporary or nearly so with the Yamhill sites. Hall (n.d.) suggests possible admixture between Athapaskan and older Penutian stock for the Coquille series. It seems likely then that cultural contact, slave trade and varying degrees of admixture in at least the coastal populations has created some biological closeness between coastal Athapaskans and the interior Kalapuya.

Maximum length, basion-bregma, and orbital breadth measurements of the Yamhill sample varied once each from three of the other populations. These measurements occasionally created a difference in the various indices containing them, providing an overall apparent difference in shape of the cranial vault with regards to length and height and a difference in width of the face. Although few in number, the differences noted in comparison of single measurements and indices suggest the need for further study using multivariate techniques.

A small number of the several measurements and indices compared actually differed between any of the populations. Further difference may be found if the combined groups are separated and sex-specific comparisons made. Combination of sexes may tend to increase standard deviation of any one measurement (especially those shown to differ significantly between sexes). This, in turn, may lead to a decrease in the value of t, and thus, number of

significant differences found. It is possible then, that more differences in cranial measurement may be found in the above compared groups when larger sample size allows separation of sexes. The problem of combining sexes may only apply to those measures that differ significantly between sexes (cranial length, basion-nasion, right basion-porion in the Yamhill sample, unknown in the other samples), but caution suggests separate comparison in all. The problem of combining sexes may be tempered somewhat by the use of index comparisons, in that the indices define general shapes of the skull and not sizes. This assumes that males and females of the same population have crania of similar shape. No differences were found between the Yamhill sexes in any of the indices (cranial module did show a significant difference, however, it is not a "shape" index, but a measure of size).

Comparison of the Yamhill population to the live Kalapuya data of Franz Boas (1891, Jantz et. al. 1992) revealed significant differences in maximum length and breadth of the crania and cranial index. Nasal height (height of nose) and bizygomatic (breadth of face) results did not differ significantly. It was expected that this group would be very similar and representative of the Yamhill population. It must be remembered, however, that at least some of that difference is attributable to flesh, skin and hair. Also, his sample includes individuals from non-Yamhill Kalapuya populations. Jantz et. al. (1992) suggest that there is considerable intertribal difference in head length and breadth, some of which may reflect artificial deformation, still occasionally practiced in the 1890's. The differences found here may be minimal, may reflect variation between Kalapuya groups, or an as yet undetermined mixing of Kalapuya and other biological groups. A more thorough comparative study of the various Kalapuya groups is needed.

Non-metric Analysis

Several non-metric variants occur at relatively high frequency within the Yamhill population, as previously mentioned (see Table 17). These include highest nuchal lines, accessory lesser palatine foramina, exsutural mastoid foramina, parietal foramina, double anterior condylar canal, complete supraorbital foramina, presence of frontal notch or foramina, patent posterior condylar canal, and extra ossicles in the lambdoid suture, at asterion, and at lambda.

Cranially deformed individuals have a significantly higher incidence of coronal and lambdoidal ossicles, and a lower frequency of patent posterior condylar canal. Artificial deformation apparently had an effect on certain genetically controlled traits in this population. Ossenberg (1970), in her study of deformed versus non-deformed crania, found a significant difference in the number of coronal ossicles, *fewer* being found in the deformed than in the non-deformed. She found no significant difference in the number of lambdoid ossicles or in the occurrence of patent posterior condylar canal (Ossenberg 1970). The type and method of deformation in Ossenberg's study population (Hopewell) is somewhat different than the Yamhill and produces a narrow frontal bone and moderate flattening of the occipital. It is apparent then that method of deformation could be an important factor in the manifestation of cranial discrete traits. In any case effects of cranial deformation on genetically controlled variants is well-documented (Bennett 1965, Ossenberg 1970). The primary cause of the differences has been debated between specific localized stresses (Bennett 1965) and a more general view of environmental stresses affecting genetically controlled head shape (Torgersen in Ossenberg 1970). In the Yamhill sample, different frequencies for some traits in deformed versus non-deformed individuals may be due to these artificial stresses, or may indicate simply that the deformed individuals are of another population - most likely from the north (lower Columbia Chinookan).

No significant differences were seen in comparison of males to females for non-metric traits. Sex differences have been noted in other studies (Corrucini 1974, Berry 1974). While age differences are noted in some studies (Corrucini 1974), they were not noted in others (Berry 1974). Age differences were not studied here as age classification of adults is not considered reli able.

Some variation was seen between sites. Lambdoid ossicles and exsutural mastoid foramina were more common at the Fuller site than at Fanning.

Comparison of Non-metric Trait Frequencies with other Populations

Comparison of occurrence in non-metric traits was possible with the Gold Hill series (Table 18). A probability level of $p < 0.05$ was considered significant. The Gold Hill sample differed in occurrence of highest nuchal line, lambdoid ossicles, ossicles at asterion, auditory tori, and exsutural mastoid foramen (also parietal notch bone $p = .0573$). Further study of non-metric variation is needed in the other regional skeletal populations and would provide a broader base for comparison.

Summary

The study has elucidated much about burial practices of the Yamhill and possibly of the Kalapuya in general. It is unfortunate that more careful attention was not paid to provenience and excavation of the burials - the information as reported must therefore still be considered only tentative. Several characteristics of the Yamhill described in the ethnographic literature are confirmed by analysis of burial goods including contact with surrounding cultures. Coastal influences are seen in the presence of the whalebone clubs. *Dentalium* and Olivella shells, as well as carved items show influence from the north (lower Columbia all the way to Vancouver Island for *Dentalium*). The large ceremonial blades demonstrate alliances to the south (southwestern Oregon or northern California).

Differences in trade item associations between deformed and non-deformed individuals suggests either a later arrival of cranial deformation practices (and possibly another cultural group) to the area, and thus possibly a multiple occupation of the Fuller and Fanning sites, or an elite class separation defined in part by artificial deformation of crania.

Metric and non-metric analyses have provided a general description of the skeletal population from the Yamhill sites. Sexual dimorphism was noted in metric but not in non-metric analyses. Cranial deformation appears to play an important role in the occurrence of certain cranial discrete traits.

In addition, interesting differences and similarities to other regional skeletal samples are demonstrated and suggestive of the need for further study of their biological relationships. Especially interesting are the Gold Hill Takelma, who were expected to be biologically similar to the Yamhill, but showed several differences in metric and non-metric traits. The differences seen in cranial length and breadth between the Yamhill and Boas Kalapuya indicates a need for comparison of the Yamhill to other Kalapuya groups - i.e. they may not represent the complete range of variation for the Willamette Valley peoples.

Further study is needed in several areas. Age classification of adults in the current study is considered unreliable and in need of refinement. Sex classification by use of femoral head diameters was problematical and indicates a need for refinement of Pearson's technique as applied to the Kalapuya and possibly all northwest native American populations. Further post-cranial measurement and analysis is necessary. Beyond these basic needs of the Yamhill series, comparison to other populations utilizing multivariate analysis of both metric and non-metric traits would be useful in determining biological relationships. With several studies of regional skeletal series underway the potential for this type of analysis has increased dramatically.

Finally, the urgent need for additional study in all aspects of osteological analysis for most skeletal populations has become progressively urgent in light of the recent political climate demanding removal of these populations from academic and curational facilities for reburial.

References Cited

Aikens, C. Melvin, ed. 1975. Archaeological Studies in the Willamette Valley, Oregon. U of O Anthropological Papers no. 8.

Aikens, C. Melvin. 1993. *Archaeology of Oregon*. USDI, BLM, Portland, Oregon.

Aufderheide, Arthur C. 1992. Summary on Disease before and after Contact. In, *Disease and Demography in the Americas.* J. Verano and D. H. Ubelaker eds. Smithsonian Institution Press, Washington and London.

Balster, C. A.; Parsons, R. B.; 1968. Geomorphology and Soils, Willamette Valley, Oregon. Oregon State University Agricultural Experiment Station, Special Report 265.

Bass, William M., 1981. *Human Osteology: A Laboratory and Field Manual of the Human Skeleton* 2nd ed. Missouri Archaeolo gical Society, Columbia, Missouri.

Baxter, Paul W.; Cheatham, Richard; Connolly, Thomas J.; Willig, Judith A. 1983. Rigdon's Horse Pasture Cave: An Upland Hunting Camp in the Western Cascades. University of Oregon Anthropological Papers no. 28.

Beckham, Stephen Dow; Toepel, Katherine Anne; Minor, Rick 1984. Native American Religious Practices and Uses in Western Oregon. University of Oregon Anthropological Papers no. 31.

Beckham, Stephen Dow; Minor, Rick; Toepel, Katherine Anne; 1981. Prehistory and History of BLM Lands in West-Central Oregon: A Cultural Resource Overview. U of O Anth Papers no. 25.

Bennett, Kenneth A. 1965. The Etiology and Genetics of Wormian bones. *American Journal of Physical Anthropology* 23:255-260.

Bennett, Kenneth A. 1972. Lumbo-Sacral Malformations and Spina Bifida Occulta in a Group of Proto-Historic Modoc Indians. *American Journal of Phy sical Anthropology* 36(3):435-439.

Bennett, Kenneth A. 1973. The Indians of Point of Pines, Arizona: A Comparative Study of Their Physical Characteristics. Anth. Papers of the Univ. of Arizona, No. 23. Univ. of Arizona Press, Tucson, Arizona.

Berreman, Joel V. 1944. Chetco Archaeology. A Report of the Lone Ranch Creek Shell Mound on the Coast of Southern Oregon. *General Series in Anthropology no. 11. American Anthropological Association*.

Berry, A. C., 1975. Factors Affecting the Incidence of Non-metrical Skeletal Variants. *Journal of Anatomy* 120:519-535.

Berry, A. C.; Berry, R. J. 1967. Epigenetic Variation in the Human Cranium. *Journal of Anatomy* 101:361-379.

Blakely, Robert, 1971. Comparison of the Mortality Profiles of Archaic, Middle Woodland, and Middle Mississippian Skeletal Populations. *American Journal of Physical Anthropology* 34(1): 43-53.

Boas, Franz, 1891. Physical Characteristics of the Tribes of the North Pacific Coast. *Report of the 61st Meeting of the British Association for the Advancement of Science*, pp 424-447.

Boyd, Robert T. 1990. Demographic History, 1774-1874. in *Handbook of North American Indians, Northwest Coast.* ed. Wayne Suttles. Smithsonian Institution, Washington.

Boyd, Robert 1991. Kalapuya Disease and Depopulation. In *What Price Eden? The Willamette Valley in Transition, 1812-1855*.

Boyd, Robert 1992. Population Decline from Two Epidemics on the Northwest Coast. In, *Disease and Demography in the Americas.* J. Verano and D. H. Ubelaker eds. Smithsonian Institution Press, Washington and London.

Brooks, S.T. 1955. Skeletal Age at Death: Reliability of Cranial nd Pubic Age Indicators. *American Journal of Physical Anthropology* 13:567-597.

Brothwell, D. R., 1981. *Digging Up Bones, The Excavation, Treatment and Study of Human Skeletal Remains*, 3rd ed. Cornell Univ. Press, Ithaca, NY.

Cheatham, Richard D. 1988. Late Archaic Settlement Pattern in the Long Tom Sub-Basin, Upper Willamette Valley, Oregon. University of Oregon Anthropological Papers no. 39.

Collins, Lloyd R. 1951. The Cultural Position of the Kalapuya in the Pacific Northwest. M.S. Thesis, Dept. of Anth, U of O, Eugene.

Connolly, Thomas J. 1983. Modeling Prehistoric Cultural Systems in the Willamette Valley: A Demonstration of Regional Diversity. In *Contributions to the Archaeology of Oregon 1981-1982*. Don Dumond ed. pp27-39. Association of Oregon Archaeologists Occasional Papers no. 2.

Corrucini, Robert S., 1974. An Examination of the Meaning of Cranial Discrete Traits for Human Skeletal Biological Studies. *American Journal of Physical Anthropology* 40:425-446.

Cressman, Luther S. 1933a. Contributions to the Archaeology of Oregon: Final Report on the Gold Hill Burial Site. *University of Oregon Publications, Studies in Anthropology v.4 no.3*. Eugene, Oregon.

Cressman, Luther S. 1933b. Aboriginal Burials in Southwestern Oregon. *American Anthropologist*, N.S. 35:116-130.

Cressman, Luther S. 1947. Further Information on Projectile Points from Oregon. *American Antiquity* 13(2):177-179.

Cressman, Luther, and William Laughlin, 1941. A Probable Association of Mammoth and Artifacts in the Willamette Valley, Oregon. *American Antiquity* 6(4):339-342.

Cybulski, Jerome S. 1978. An Earlier Population of Hesquiat Harbor, British Columbia: A Contribution to Nootkan Osteology and Physical Anthropology. *British Columbia Provincial Museum. Cultural Recovery Papers 1*. Victoria.

Cybulski, Jerome S. 1990. Human Biology. in *Handbook of North American Indians, Northwest Coast.* ed. Wayne Suttles. Smithsonian Institution, Washington.

Davis, Wilbur A. 1970. Archaeology of Phase I, Little Muddy Creek, Oregon. Final Report, U.S. Department of Interior Contract-Purchase Order #940-631 between the National Park Service and Oregon State University.

Davis, Wilbur A., C. Melvin Aikens, and Otto E. Henrickson. 1973. Archaeology of Phase III, Little Muddy Creek, Oregon. Final Report, U.S. Department of Interior Contract #4970P20038, between the National Park Service and Northwest Archaeological Research Institute.

Douglas, David 1959. *Journal Kept by David Douglas During His Travels in North America 1823-1927.* London: W. Wesley & Son.

Edmundson, W.T. and William S. Laughlin, 1941-42. Excavation field notes and correspondence. Oregon State Museum of Anthropology, Accession No. 88.

Ferllini, Roxana. 1989. Human Skeletal Remains from Gold Hill, Southwestern Oregon: Morphological Comparison with Prehistoric Modoc, Paiute, Shoshoni and Athapaskan Assemblages. MA Thesis, U of Oregon, Dept. of Anth, Eugene, Oregon.

Frachtenberg, Leo J., 1918. Comparative Studies in Takelman, Kalapuyan, and Chinookan, Lexicography. A Preliminary Paper. *International Journal of American Linguistics* 1(2):175-182.

Genoves, Santiago; 1967. Proportionality of the Long Bones and Their Relation to Stature Among Mesoamericans. *American Journal of Physical Anthropology* 26:67-77.

Gilbert, B. Miles, and T.W. McKern. 1973. A Method for Aging the Female Os Pubis. *American Journal of Physical Anthropology* 38:31-38.

Gray, Dennis. 1985. The Takelma and Their Athapaskan Kin: An Ethnographic Synthesis of Southwestern Oregon. unpublished Master's Thesis, Oregon State University, Department of Anthropology.

Gray, Henry. 1976. *Anatomy, Descriptive and Surgical*. Bounty Books, New York.

Habeck, J. R. 1961. The Original Vegetation of the Mid-Willamette Valley, Oregon. *Northwest Science*, 35(2):65-77.

Hall, Roberta L. 1976. Functional Relationships Between Dental Attrition and the Helicoidal Plane. *American Journal of Physical Anthropology* 45:69-76.

Hall, Roberta L.; 1978. Sexual Dimorphism for Size in Seven Nineteenth Century Northwest Coast Populations. *Human Biology* 50(2):159-171.

Hall, Roberta. no date. draft manuscript, Human Biology of the Coquille People.

Hall, Roberta L.and T. German 1975. Dental Pathology, Attrition and Occlusal Surface Form in a Prehistoric Sample from British Columbia. *Syesis*, 8:275-289.

Hall, Roberta L.; Peter McNair, 1972. Multivariate Analysis of Anthropometric Data and Classification of British Columbian Natives. *American Journal of Physical Anthropology* 37:401-410.

Hall, Roberta L., Robert Morrow, J. Henry Clarke. 1986. Dental Pathology of Prehistoric Residents of Oregon. *American Journal of Physical Anthropology* 69:325-334.

Hemphill, Brian E., 1992a. An Osteological Analysis of the Remains from Malheur Lake, Oregon. Volume One: HRA Field Seasons, 1988-1990. Heritage Research Associates Report No. 117, to U.S. Fish and Wildlife Service, Malheur National Wildlife Refuge, Princeton ,Oregon.

Hemphill, Brian E., 1992b. An Osteological Analysis of the Remains from Malheur Lake, Oregon. Volume Two: Refuge Field Season, 1990. Heritage Research Associates Report No. 118, to U.S. Fish and Wildlife Service, Malheur National Wildlife Refuge, Princeton ,Oregon.

Hemphill, Brian E., 1992c. An Osteological Analysis of the Remains from Malheur Lake, Oregon. Volume Three: Refuge Field Season, 1991. Heritage Research Associates Report No. 129, to U.S. Fish and Wildlife Service, Malheur National Wildlife Refuge, Princeton ,Oregon.

Hodge Frederick W. ed. 1907. Handbook of American Indians North of Mexico. *Bureau of American Ethnology, Bulletin 30, Part 1.*

Hodge, Frederick, W.; 1910. Handbook of American Indians North of Mexico. *Bureau of American Ethnology, Bulletin 30, Part 2.*

Howells, W.W. 1973. Cranial Variation in Man. in *Papers of the Peabody Museum of Archaeology and Ethnology*, Harvard University, vol. 67.

Iscan, M. Y., Kennedy, K. A. R., 1989. *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., NY.

Iscan, M. Y., Loth, S. R., 1989. Osteological Manifestations of Age in the Adult. in *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., NY. ed. by Iscan, M. Y. and Kennedy, K. A. R..

Jackes, M.K. 1985. Pubic Symphysis Age Distributions. *American Journal of Physical Anthropology* 68:281-299.

Jacobs, Melville, 1937. Historic Perspectives in Indian Languages of Oregon and Washington. *Pacific Northwest Quarterly* 28:55-74.

Jacobs, Melville, 1962. The Fate of Indian Oral Literatures in Oregon. *Northwest Review* 5:90-99.

Jacobs, Melville, Albert Gatschet, Leo Frachtenberg, 1945. Kalapuya Texts. *University of Washington Publications in Anthropology,* 11.

Jantz, R. L., D. R. Hunt, A. B. Falsetti, P.J. Key. 1992. Variation among North Amerindians: Analysis of Boas's Anthropometric Data. *Human Biology* 64(3):435-461.

Johannessen, Carl L., William A,. Davenport, Artimus Millet, Steven McWilliams, 1970. The Vegetation of the Willamette Valley. *Annals of the Association of American Geographers*, 61:286-302.

Johnston, Francis E., Louise O. Zimmer, , 1989. Assessment of Growth and Age in the Immature Skeleton. in *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., NY. ed. by Iscan, M. Y. and Kennedy, K. A. R..

Kinkade, M. Dale. 1990. History of Research in Linguistics. in *Handbook of North American Indians, Northwest Coast.* ed. by Wayne Suttles, Smithsonian Institution, Washington.

Krogman, W.M. 1962. *The Human Skeleton in Forensic Medicine.* Charles C. Thomas, Springfield, Illinois.

Krogman, W.M. and M.Y. Iscan, 1986. *The Human Skeleton in Forensic Medicine.* Charles C. Thomas, Springfield, Illinois.

Laughlin, William S. 1941. Excavations in the Calapuya Mounds of the Willamette Valley; Oregon. *American Antiquity* (2):147-155.

Laughlin, William S. 1943. Notes on the Archaeology of the Yamhill River, Willamette Valley, Oregon. *American Antiquity* 9:220-229.

Longwood, Franklin Russell 1940. A Land Use History of Benton County Oregon. Masters Thesis, Oregon State University, Corvallis.

Lovejoy, C. Owen. 1985. Dental Wear in the Libben Population: Its Functional Pattern and Role in the Determination of Adult Skeletal Age at Death. *American Journal of Physical Anthropology* 68:47-56.

Loy, William G.; Stuart Allen, Clyde P. Patton, Robert D. Plank, 1976. *Atlas of Oregon*. University of Oregon Press, Eugene.

Lyman, H.S. 1900. Reminisces of F.X. Matthieu. *Oregon Historical Quarterly* 1(1):73-104.

McKern, T.W. and T. Dale Stewart. 1957. Skeletal Age Changes in Young American Males. Tech, Report EP45, Quartermaster Res. and Dev. Command. Natick.

McNeil, R. William, George N. Newton, 1965. Cranial Base Morphology in Association with Intentional Cranial Vault Deformation. *American Journal of Physical Anthropology* 23:241-254.

Meindl, R.S. and C.O. Lovejoy, 1985. Ectocranial Suture Closure: A Revised Method for the Determination of Skeletal Age at Death Based on the Lateral-Anterior Sutures. *American Journal of Physical Anthropology* 68:57-66.

Meindl, R.S., C.O. Lovejoy, R.P. Mensforth, R.A. Walker. 1985. A Revised Method of Age Determination Using the Os Pubis. *American Journal of Physical Anthropology* 68:36-45.

Miller, Floyd Eugene. 1975. The Benjamin Sites, 35LA41, 42. in *Archaeological Studies in the Willamette Valley, Oregon*. ed. by C. Melvin Aikens. University of Oregon Anthropological Papers 8:309-348.

Minor, Rick; Stephen Dow Beckham, Phyllis E. Lancefield-Steeves, Katherine Anne Toepel, 1980. Cultural Resource Overview of the BLM Salem District, Northwestern Oregon: Archaeology, Ethnography, History. University of Oregon Anthropological Papers no. 20.

Molnar, S.F. 1971. Human Tooth Wear, Tooth Function and Cultural Variability. *American Journal of Physical Anthropology* 34:175-190.

Moore-Jansen, Peer, and Richard L. Jantz, 1989. Data Collection Procedures for Forensic Skeletal Material. Report of Investigations No. 48, The University of Tennessee, Department of Anthropology, Knoxville.

Murdy, Carson N., Walter J. Wentz, 1975. Artifacts from Fanning Mound Willamette Valley, Oregon. In Archaeological Studies in the Willamette Valley, Oregon. C. Melvin Aikens ed. pp 349-374. U of O Anth Papers no. 8.

Neumann, Georg K. and Cheryl G. Waldman. 1968. Regression Formulae for the Reconstruction of the Stature of Hopewellian and Middle Mississippi Amerindian Populations. *Proceedings of the Indiana Academy of Science* 77:98-101.

Olivier, Georges. 1969. *Practical Anthropology*. Charles C. Thomas, Publisher, Springfield.

Ortner, Donald J. 1992. Skeletal Paleopathology, Probabilities, Possibilities, and Impossibilities. In, *Disease and Demography in the Americas.* J. Verano and D. H. Ubelaker eds. Smithsonian Institution Press, Washington and London.

Ortner, D. J., N. Tuross, A. Stix. 1992. New Approaches to the Study of Disease in Archaeological New World Populations. *Human Biology* 64(3): 337-360.

Ossenberg, Nancy. 1970. The Influence of Artificial Cranial Deformation on Discontinuous Morphological Traits. *American Journal of Physical Anthropology* 33:357-372.

Pettigrew, Richard M.; 1980. Archaeological Investigations at Hagar's Grove, Salem, Oregon. University of Oregon Anthropological Papers no. 17.

Phenice, T. W.; 1967. A Newly Developed Visual Method of Sexing the Os Pubis. *American Journal of Physical Anthropology* 30:297-302.

Rightmire, G.P. 1969. On the Computation of Mahalanobis' Generalized Distance (D2). *American Journal of Physical Anthropology* 30:169-195.

Sampson, C. Garth, 1985. Nightfire Island: Later Holocene Lakemarsh Adaptation on the Western Edge of the Great Basin. Univ. of Oregon Anthropological Papers No. 33.

Sapir, Edward, 1907. Notes on the Takelma Indians of Southwestern Oregon. *American Anthropologist* 9:251-275.

Saul, F.P. and J.M. Saul. 1989. Osteobiography: A Maya Example. in *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., NY. ed. by Iscan, M.Y. and Kennedy, K.A.R..

Saunders, Shelley R. 1989. Nonmetric Skeletal Variation. in *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., NY. ed. by Iscan, M. Y. and Kennedy, K. A. R..

Scouler, John. 1905. Dr. John Scouler's Journal of a Voyage to N.W. America, 1824. F.G. Young editor. Oregon Historical Quarterly 6(1):54-75, (2):159-205, (3):276-287.

Shipman, P., Walker, A., Bichell, D., 1985. *The Human Skeleton*. Harvard Univ. Press, Cambridge, Mass.

Sperling, O.B. ed. 1931. *The Brackenridge, Journal for the Oregon Country*. Seattle: University of Washington Press.

St. Hoyme, L. E., M. Y. Iscan, 1989. Determination of Sex and Race: Accuracy and Assumptions. in *Reconstruction of Life from the Skeleton.* Alan R. Liss, Inc., NY. ed. by Iscan, M. Y. and Kennedy, K. A. R..

Stewart, T. Dale, 1979. *Essentials of Forensic Anthropology*. Illinois: Charles C. Thomas Publisher.

Suttles, Wayne. ed. 1990. *Handbook of North American Indians, Northwest Coast*. Smithsonian Institution, Washington.

Thompson, Laurence and M. Dale Kinkade. 1990. Languages. in *Handbook of North American Indians, Northwest Coast.* ed. Wayne Suttles. Smithsonian Institution, Washington.

Thwaites, Ruben G. ed. 1959. *Original Journals of the Lewis and Clark Expedition 1804-1806*. New York, Antiquarian Press.

Todd, T.W. 1920. Age Changes in the Pubic Bone: I. The Male White Pubis. *American Journal of Physical Anthropology* 3:285-334.

Todd, T.W. 1921a. Age Changes in the Pubic Bone: II. The Pubis of the Male Negro-White Hybrid; III. The P ubis of the White Female; IV. The Pubis of the Female Negro- White Hybrid. *American Journal of Physical Anthropology* 4:1-70.

Todd, T.W. 1921b. Age Changes in the Pubic Bone: VI. The Interpretation of Variations in the Symphyseal Area.. *American Journal of Physical Anthropology* 4:1-70.

Todd, T.W. and D.W. Lyon, 1924. Endocranial Suture Closure, Its Progress and Age Relationship: Part I. Adult Males of White Stock. *American Journal of Physical Anthropology* 7:325-384.

Todd, T.W. and D.W. Lyon, 1925a. Cranial Suture Closure, I ts Progress and Age Relationship: Part II. Ectocranial Closure in Adult Males of White Stock. *American Journal of Physical Anthropology* 8:23-45.

Todd, T.W. and D.W. Lyon, 1925b. Cranial Suture Closure, Its Progress and Age Relationship: Part III. Endocranial Closure in Adult Males of Negro Stock. *American Journal of Physical Anthropology* 8:47-71.

Todd, T.W. and D.W. Lyon, 1925c. Cranial Suture Closure, Its Progress and Age Relationship: Part IV. Ectocranial Closure in Adult Males of Negro Stock. *American Journal of Physical Anthropology* 8:149-168.

Toepel, Kathryn Anne, 1985. The Flanagan Site: 6000 Years of Occupation in the Upper Willamette Valley, Oregon. Ph.D. Dissertation, Department of Anthropology, University of Oregon.

Towle, Jerry C. 1974. Woodland in the Willamette Valley: An Historical Geography. Unpublished PH.D. Dissertation, Department of Geography, University of Oregon, Eugene.

Towle, Jerry C. 1979. Settlement and Subsistence in the Willamette Valley: Some Additional Considerations. *Northwest Anthropological Research Notes* 13:12-21.

Trotter, Mildred, Goldine C. Gleser, 1952. Estimation of Stature from Long Bones of American Whites and Negroes. *American Journal of Physical Anthropology* 10:463-514.

Trotter, Mildred, Goldine C. Gleser, 1958. A Re-Evaluation of Estimation of Stature Based on Measurements of Stature Taken During Life and of Long Bones after Death. *American Journal of Physical Anthropology* 16:79-123.

Ubelaker, D. H., 1992a. Patterns of Demographic Change in the Americas. *Human Biology* 64(3): 361-379.

Ubelaker, Douglas H. 1992b. North American Indian Population Size, Changing Perspectives. In, *Disease and Demography in the Americas*. J. Verano and D. H. Ubelaker eds. Smithsonian Institution Press, Washington and London.

Verano, John W.; Douglas H. Ubelaker, 1992. *Disease and Demography in the Americas*. Smithsonian Institution Press Washington and London.

White, John R.; 1974. Prehistoric Sites of the Upper Willamette Valley: A Proposed Typology. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Oregon, Eugene.

White, John R.; 1975. A Proposed Typology of Willamette Valley Sites. In Archaeological Studies in the Willamette Valley, Oregon, ed. C. Melvin Aikens. University of Oregon Anthropological Papers no. 8:141-225.

Woodward, John A., Carson N. Murdy, Franklin Young, 1975. Artifacts from Fuller Mound, Willamette Valley, Oregon. In Archaeological Studies in the Willamette Valley, Oregon. C. Melvin Aikens ed. pp 375-420. U of O Anth Papers no.8.

Zenk, Henry B. 1976. Contributions to Tualatin Ethnography: Subsistence and Ethnobotany. Unpublished M.A. Thesis, Department of Anthropology, Portland State University.

Zenk, Henry B. 1990. The Kalapuya. In *Handbook of North American Indians, Northwest Coast*. ed. Wayne Suttles. Smithsonian Institution, Washington.

Appendices

Appendix A

Table 19. Fuller and Fanning Mounds, Human Remains. Burial Descriptions

Burial #	Fanning #1
OSMA #	11-187
Burial Type	Flexed (Laughlin) / Semi-flexed (Collins)
Side	Right (Collins)
Orientation	Head to east (Collins)
Grave Type	unknown
Associations and Provenience	No associated artifacts were found with this burial. Located next to a post, same as referenced for Fanning #2. Burial was noted to have been found "at the depths of the mound."
Sex Estimate	Laughlin : female? (in notes) Collins : none Stepp : Female (femoral head, crania)
Age Estimate	Laughlin : "young adult" (in notes) Collins : none Stepp : 26-31 (cranial suture closure)
Stature Estimate	1562 mm - 1583 mm
Notes/Observations from previous researchers	Edmundson : "You can also have the incomplete skeleton we found, likewise at the depths of the mound. The skull is about half there (Posterior half). There is 1 humerus, 2 femora, 1 1/2 tibia, 1 fibula, one scapula and some ribs and small bones from hands, feet, etc. Burial was head east, on rgt side knees and hips flexed. There were no associated artifacts."

Burial #	Fanning #1
OSMA#	11-187
Case Description (Stepp)	Remains are located at OSMA. This burial was noted as "flexed" by Laughlin and "Semi-flexed" by Collins. Edmundson states that the knees and hips were flexed, but mentions nothing of the arms. He found only one humerus and one scapula, so he may not have known the state of flexure of the arms. The burial had at least legs flexed, with unknown configuration of arms. The burial was lying on its right side with head oriented to the east. Grave type is unknown.
Preservation and Inventory	Few cranial remains are present but include both parietals and fragments of right temporal and occipital. Few post-cranial remains survive. as well. The distal right humerus is present, the left has fragment of diaphysis only. The left radius contains proximal and distal ends and fragmentary diaphysis. The right ulna has proximal end and fragmentary diaphysis. The right femur is complete, the left has distal end and fragmentary diaphysis. The right tibia is distal end and diaphysis, the left is fragmentary proximal end and diaphysis. The right fibula has distal end and diaphysis and fragmentary proximal end. The right navicular is present. The third left metacarpal is present.
Sex Determination	The individual is determined to be female. Femoral head diameter is 37.0 mm (right), within the range for females. Cranial traits indicating female include small mastoid processes and parietal bossing (but cranial remains are very fragmentary).
Age at Death	Age at death is determined to be in the range 26-31 years of age. All epiphyses available for study are closed, and endocranial suture closure has occurred along the sagittal and lambdoidal sutures.
Stature	Stature is estimated between 1562 mm (Genoves) and 1583 mm (Neumann and Waldman). Maximum length of femur (right) is 411 mm and in-position length is 409 mm. Laughlin provides a maximum femoral length of 413 mm, providing a stature estimate of 1567 mm (Genoves).
Metric and Non-Metric Analysis	Only maximum breadth of the crania could be measured. In addition, very few non-metric traits could be assessed. Post-cranial measurement was completed for both femora, although the left femur could not be measured for lengths or maximum head diameter. Laughlin provided a femoral length (maximum) of 413 mm, a 2 mm variance from the current result.
Dental Analysis	No dental analyses were possible.
Pathology/ Anomaly	There is an unusual depression of bone on occipital just below lambda. Examined by Holm Neumann, who thought it looked like normal bone, except for being depressed. Just an anomalous or congenital condition.

Burial #	Fanning #2
OSMA #	11-188
Burial Type	Flexed (Edmundson sketch)
Side	Left (Edmundson sketch)
Orientation	Head to NW (Laughlin) / Head to North (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	An elk-horn wedge located one foot west of skull. Three fish vertebrae and "chipping point made of stone" also found. Buried directly above Fanning #12 (real association uncertain). Located five feet west? and eight feet south? of same post referenced with Fanning #1. Depth was three feet. Pelvis located three feet south of other remains.
Sex Estimate	Laughlin : Female (female? in notes) Collins : Female Stepp : Female? (crania)
Age Estimate	Laughlin : Adolescent (in notes) Collins : Adolescent Stepp : 13-18 years (dentition, epiphyses)
Stature Estimate	1567 mm (from Laughlin measurement)
Notes/Observations from previous researchers	Edmundson : "I ran into the skull by shearing of f a slab three inches across with the shovel. (right parietal region) After that, I treated it with more respect, and removed it virtually intact. The only vertebral associated were lumbar, one scapula, arms were also present. Eventually I chopped into the pelvis 3 feet south of the head. Since it was impossible to excavate it because it was under a crop of wheat, I Added the arms. I expect to dig all up when the wheat is harvest." "The skull is a 17-18 year adolescent, female. Radii ulnae epiphyses are united, humeral head is ununited" "Wisdom teeth are unerrupted. Base of skull had been broken in, skull full of dirt." Notes of 10/20/41... "The bones of Fanning #2 are fragmentary. Unjoined epiphyses prove adolescence. It will probably be impossible to sort out all bones of the two skeletons (#12). You will note that the pelves were super imposed, #2 being a little shallower then the recent find."

Burial #	Fanning #2
OSMA#	11-188
Case Description (Stepp)	Remains are located at OSMA. Burial was flexed and lying on left side. Orientation is uncertain, Edmundson's sketch has no north arrow and Laughlin states head was to NW, while Collins says N (sketch shows head to top of paper, which is usually Edmundson's north). Collin's lists as a "pit" burial, but origin of this information is unknown. Buried directly above Fanning #12, but real association is uncertain - may have been intrusive onto #12.
Preservation and Inventory	Cranial remains present include The left parietal, both temporals, the maxilla, both malars, the frontal, occipital and sphenoid. The right parietal and palatine are fragmentary. The mandible is nearly complete, missing only the the left condyle. Post-cranial remains are fragmentary. Four cervical vertebrae (not first or second) are present. The right innominate is represented only by a fragmentary ischium. The left humerus has proximal end and diaphysis. Both radii have proximal ends and fragmentary diaphyses. The right ulna has proximal end and diaphysis. The left scapula has glenoid fossa and fragmentary acromion. The right clavicle is present, the left has only medial end. There are seven rib fragments present. The sternal body is present. The right femur has distal and diaphysis portions only. The right tibia has only a diaphysis present, the left has distal end and diaphysis. A scaphoid and trapezium are present. Two fragmentary metatarsals and /or metacarpals are present. Two phalanges are present. There are several extra elements labeled "11-196" (Fanning #12, buried just below this individual) that may belong to Fanning #2 including a right acromial process from scapula, a left shovel-damaged and rodent gnawed diaphysis of femur, an unsided fragment of femur diaphysis, an extra proximal end of right humerus and an extra distal end of right humerus. In fact all of these elements are missing from 11-188 (#2).
Sex Determination	Sex is determined to be a probable female (female?) from cranial morphology. However, the individual is still adolescent and so the estimation is tenuous. Cranial traits indicating female include a high forehead, parietal eminences, no brow ridge, and sharp supraorbital margins. Mastoid processes and palate are intermediate in size. Laughlin and Edmundson both assess as female.
Age at Death	Age at death is determined to be between 13 and 18 years of age. Second molars have erupted, and are just beginning to show wear (20). Third molars have not erupted and there is so little room in the alveolus that they may be missing congenitally. The radius and ulnar epiphyses are fused but the humeral head is unfused indicating an age in the range 16-early 20's.

Burial #	Fanning #2
OSMA #	11-188
Stature	Stature is estimated at 1567 mm (Genoves). Femoral lengths were not accurately obtainable at present, but Laughlin provides a femoral length of 413 mm.
Metric and Non-Metric Analysis	Metrics of the skull were affected by several missing landmarks and bones including basion (estimated), prosthion (estimated), staphylion (estimated), right dacryon (rebuilt), the zygomatic arches (rebuilt with sticks), the left mandibular condyle, and the right gonion. There is also a slight asymmetry to the skull. Many of the missing landmarks were easily estimated, however, and only the foramen magnum length could not be obtained. Most non-metric traits were also assessable. Post-cranially, only the right femur could be measured. Femoral head diameter was not possible, and lengths were only estimated to be something greater than 39.7 mm (max length) and 39.2 mm (in-position). Laughlin provides measurements of cranial length and breadth, bizygomatic, upper facial height (nasion-prosthion), height of mandibular symphysis, bigonial, nasal height and width, orbital heights, and femoral length. His results typically varied 0-2 mm from current results. Bigonial varied by 8 mm, but in the current measurement was only estimated by measuring the left side and doubling the result. Femoral length varied by 16 mm but the current result was only a minimal estimate as the head of the femur is fragmentary.
Dental Analysis	Maxillary teeth present include both canines, all premolars and the first and second molars. The four incisors are missing postmortem. The third molars are either not erupted or missing congenitally. There is little room for the third molars. Mandibular teeth present include all but the third molars. Again, the third molars are either not erupted or are missing congenitally. There is also little room for them. Tooth wear is not heavy and ranges from 20 in the second molars to 25 in the lower premolars and upper first premolars, 30 in the upper second premolars, all canines and all incisors, to a high of 40 in the first molars (35 in the lower right first molar).
Pathology/ Anomaly	There is a small extra ossicle on the left side lambdoid suture. There is a slight ridge along the sagittal line. The skull suffers a slight asymmetry in form, possibly due to post-depositional deformation.
Other	There may be some confusion of bones with Fanning #12.

Burial #	Fanning #3
OSMA #	11-189
Burial Type	Flexed
Side	Left (Laughlin)
Orientation	NE (Laughlin) / Head to N (Edmundson)
Grave Type	Pit (Collins)
Associations and Provenience	Olivella and bone beads were found with burial. Located three feet north and five feet west of post. No depth was recorded. This post is either the same one referenced with fanning 3's 1-2 or a nearby post.
Sex Estimate	Laughlin : Male Collins : Indeterminate Stepp : Male (crania)
Age Estimate	Laughlin : "aged adult" (in notes) Collins : Indeterminate Stepp : > 21 (dentition, epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 6/30/41... "Filled in gap between previous digs." "All bones save the skull were in good condition except sacrum, 3 forearms, all intimately associated." "Skull though scattered as much as 18 inches may be reconstructable. The vault of the skull is mostly there, and casual exam shows the base of occipital, both temporals, 1 maxilla, the mandible and one molar."

Burial #	Fanning #3
OSMA#	11-189
Case Description (Stepp)	Remains are located at OSMA. Burial was flexed, lying on left side and oriented with head to the north or northeast. Laughlin says northeast, but Edmundson states to north and sketch shows to slightly east of north. Collins states this was a "pit" burial but his source of information is uncertain.
Preservation and Inventory	Cranial remains present include both parietals, the left temporal, the maxilla, and the right malar. Fragments of right temporal, the frontal and the occipital are present. Only the frontal, parietals and left temporal are articulated. The occipital fragment can be held in place. The mandible is nearly complete but missing the right condyle. No post-cranial remains were present. Edmundson did say that post-cranial remains were in good condition. The reason for their absence is unknown.
Sex Determination	Sex is determined to be male. Cranial traits only are included in the assessment: large mastoid processes and a wide gonial angle and squarish mandible.
Age at Death	Age at death is determined to be at least greater than 21 years. Dental eruption is complete and third molars are exhibiting wear (40). The spheno-occipital synchondrosous is also fused indicating age in excess of 21 years. No cranial suture closure is apparent however, suggesting the individual may still be in their 20's.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Few cranial metrics were possible due to fragmentary nature of crania. Cranial length, breadth and left porion-nasion were obtained. Most mandibular measurements were possible. The right condyle is missing, forcing an estimate of bicondylar diameter. Right gonial angle and height of ascending ramus were not possible. Maxillary measurements were all obtained, but palate length was estimated due to a missing staphylion.
Dental Analysis	Maxillary teeth include the left second molar, and the right lateral incisor, canine, premolars, and first molar. The left incisors, canine and premolars, and the right central incisor, and second and third molars are missing postmortem. The left first molar is missing antemortem. The left third molar is missing due to missing bone. Mandibular teeth present include the left canine and second and third molars. The first molars are both missing antemortem. All other lower teeth are missing postmortem. Bone resorption has occurred at all sites of antemortem tooth loss.

Burial #	Fanning #3
OSMA #	11-189
	Occlusal caries occurs at the upper right canine and first molar and the lower left third molar. Dental attrition levels vary from 40 in the lower left third molar, to 60 in the lower left second molar and the upper right second premolar, to 70 in the upper left second molar, the upper right first premolar and the upper right first molar, to 75 in the lower left canine and the upper right lateral incisor, to a high of 80 in the upper right canine.
Pathology/ Anomaly	Occlusal caries occurs in the lower left third molar, and the upper right canine and first molar. The maxilla and palate are oddly elliptic in shape.

Burial #	Fanning #4a
OSMA #	11-190
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown
Sex Estimate	Laughlin : none Collins : none Stepp : Indeterminate
Age Estimate	Laughlin : none Collins : none Stepp : > 21 years (epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	This appears to be an extra individual not mentioned in notes. See Fanning #4b.

Burial #	Fanning #4a
OSMA#	11-190
Case Description (Stepp)	Remains are located at OSMA. This appears to be an extra individual not recorded in the field notes. Fanning #4b is believed to be the individual listed as #4 in the field notes. No information on this burial is available.
Preservation and Inventory	The only cranial element with these remains is a fragment of occipital including the occipital condyles and foramen magnum. There is no identification number on this piece but it is in box with other post-cranial remains labeled 11-190 and has same soil and color as these other labeled bones. Post-cranial remains are very fragmentary but include six thoracic and one lumbar vertebrae. The left innominate consists of fragmentary ischium, iliac blade and acetabulum. There is a right distal ulna and unsided ulna diaphysis fragment. The left scapula consists of glenoid fossa, acromion and fragments of spine and corocoid process. There are 25 small rib fragments. The body of the sternum is fragmentary. The right tibia consists of a fragmentary proximal end. There is an unsided fragment of proximal fibula. There are six fragmentary metatarsals and /or metacarpals. An unsided lunate and five phalanges are present.
Sex Determination	No sex determination is made from these remains.
Age at Death	Age at death is determined to be greater than 21 years of age as all epiphyses available for study are fused. In addition, the lone lumbar vertebrae present exhibits osteoarthritic lipping suggesting advanced age.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	No metric analyses (cranial or post-cranial) are possible. A few non-metric assessments are taken for the basi-occipital area.
Dental Analysis	No dental analyses are possible.
Pathology/ Anomaly	The lone lumbar vertebrae present exhibits osteoarthritic lipping. This is absent in the thoracic vertebrae present.
Other	There is also a mandible fragment from a rodent in with these remains.

Burial #	Fanning #4b
OSMA #	11-191
Burial Type	Semi-flexed
Side	Right
Orientation	NW (Laughlin) / East (Edmundson)
Grave Type	possible pit burial
Associations and Provenience	Near the knees was found one "killed" mortar (broken in half) and one small stone bowl with a shallow, oval basin. Located along (and under)fenceline at a depth of five feet and at the base of the mound. Probably the same fence as referenced in Fanning #'s 1-2.
Gex Estimate	Laughlin : Male Collins : Indeterminate Stepp : Male? (pelvis)
Age Estimate	Laughlin : aged adult Collins : Indeterminate Stepp : > 21 years (dentition, epiphyses)
Stature Estimate	1640 mm - 1664 mm
Notes/Observations from previous researchers	Edmundson : Notes of 7/4/41... "As indicated we found a skeleton, which extended under the fence so that only the legs and forearms were removed. The position was on the right side, legs flexed and together but arms were extended at the elbow rather than being flexed. ..... Again the dirt was looser than usual, suggesting intrasion (sic). Skeleton was at or very close the base of the mound." Notes of 7/6/41... "Today Fanning #4 was completed.....Found half of skull was gone. Head was inclined towards east."

Burial #	Fanning #4b
OSMA#	11-191

Case Description (Stepp)

Remains are located at OSMA. There are two individuals listed as Fanning #4 (I have listed them as "a" and "b"). It is believed that Fanning #4b (11-191) is the burial mentioned in Edmundson's notes and in Laughlin (1943). This individual is much more complete and has more of attributes listed in field notes than"a" (11-190). The current measurements also match with Laughlin's original metric results. The burial was semi-flexed with legs drawn up but arms extended. It lay on its right side and was oriented to either the northwest (Laughlin) or the east (Edmundson). The grave is possibly a pit burial as suggested by the "loose" fill.

Preservation and Inventory

Cranial remains present include both parietals, and both temporals. Fragmentary elements include the frontal, occipital and sphenoid. The basi-occipital is mostly missing, with one fragment of condyle present. The mandible is complete. There are extra parietal fragments labeled 11-191 but they do not fit this individual.

Post-cranial remains are fragmentary. The first and second cervical and two other cervical vertebrae are present. One thoracic and five lumbar vertebrae are present. The right innominate consists of an ilium with fragmentary auricular surface and a fragmentary ischium. The left innominate consists only of an ilium with fragmentary acetabulum and auricular surface. The left humerus is complete, while the right has a fragmentary distal end and a diaphysis. The right radius has proximal end and fragmentary diaphysis. The ulnae have proximal ends and fragmentary diaphyses. Both femora are present. The left patella is present. The right tibia is present, while the left has distal end and diaphysis with fragmentary proximal end. The right fibula has distal end and diaphysis, while the left has distal end and fragmentary diaphysis. The right talus and right calcaneus are present. There are two metatarsals and four metacarpals and thirteen phalanges present. There is an extra proximal end left femur with "11-191" written on it, but with a tag that says "192?"

Gex Determination

Gex is determined to be a probable male (male?). Pelvic traits indicating male include a narrow sciatic notch, and no pre-auricular sulcus is present. Cranial traits are ambiguous and suggest neither sex. Femoral head diameters are 44.0 mm (both sides), in the unknown range for Pearson's sex estimation based on head diameters.

Age at Death

Age at death is determined to be greater than 21 years. All third molars are erupted and subsequently lost antemortem with bone resorption, except the upper left which has attrition level 25. (This upper tooth is loose and there is no maxilla). All post-cranial epiphyses available for study are closed, suggesting age greater than 21 years.

Stature

Stature estimates range from 1640 mm (Genoves), to 1654 mm (Trotter and Gleser), to 1663 mm (Neumann and Waldman). Maximum length of femurs are 432 mm, while in-position lengths are

Burial #	Fanning #4b
OSMA #	11-191
	429 mm. Laughlin provides a femoral length of 434 mm, which provides stature estimates of 1647 mm (Genoves) and 1659 mm (Trotter and Gleser).
Metric and Non-Metric Analysis	Only maximum breadth of the crania could be obtained. All measurements of the mandible were obtained. No maxilla is present. Few non-metric traits were assessable. Both femora and the right innominate were measured completely. Laughlin measured the height of mandibular symphysis, the bigonial diameter and femoral length. His results varied from the current by 0-2 mm.
Dental Analysis	No maxilla is present, but one left third molar is available. It exhibits attrition level 25. Mandibular teeth present include only the right second premolar and the right first molar. The left lateral incisor, canine and premolars are missing postmortem. The right canine and first premolar are missing postmortem. The central and right lateral incisor are possibly missing antemortem, but it is difficult to judge. Bone resorption, if present, is minimal at these sites. The right second and third molars and the left molars are all missing antemortem with resultant bone resorption. Attrition level of the lower right second premolar and first molar is 70.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #5
OSMA #	11-192
Burial Type	Flexed
Side	Left (Laughlin)
Orientation	Head to North
Grave Type	unknown
Associations and Provenience	An owl's head carved in bone was found with this burial. Located south of fence in same area as Fanning #'s 1-4.
Sex Estimate	Laughlin : Male Collins : none Stepp : Indeterminate
Age Estimate	Laughlin : adult (in notes) Collins : none Stepp : 20-21 years (dentition)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 7/6/41... "Wald excavated south of fence and found Fanning #5. Sole associated artifact was an owl's head, carved of bone." Laughlin : "occipital deformation?"

Burial #	Fanning #5
OSMA#	11-192
Case Description (Stepp)	Remains are located at OSMA. This burial is reported to have been flexed, lying on its left side, with head oriented to the north. Edmundson's sketch, however, appears to show the burial on its back or right side (difficult to judge) and the arms on either side of the body, bent at elbows. The grave type is not mentioned. This individual was excavated by Mark Wald. The location given is non-specific but appears to be in the same area as all four previous Fanning burials. Laughlin hints at possible "occipital deformation" but this was not confirmed in the current study - the crania is disarticulated but can be pieced together.
Preservation and Inventory	Cranial remains present include the left temporal, the maxilla, and the left malar. Fragmentary elements include the parietals, right temporal, the nasals, the frontal, occipital, and sphenoid. The mandible is complete. (The mandible is labeled "11-193" but has a tag reading "11-192" - it occludes well with the maxilla labeled 11-192, and there is another fragment of mandible marked 11-193. No post-cranial remains are present.
Sex Determination	No sex determination could be made from these remains. Cranial traits indicating sex include long mastoids (but intermediate in size), a medium to high forehead, and a slight brow ridge - none of which suggest either sex strongly.
Age at Death	Age at death is determined to be approximately 20-21 years. The lower third molars are fully erupted and are beginning to wear (attrition level 20). The upper right third molar is almost fully erupted and also shows some wear (20). Cranial bones are disarticulated but no evidence of suture closure is apparent.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Few cranial measurements were possible but those obtained include left porion-nasion, and rough estimates of length and breadth, and a rough estimate of maximum frontal breadth. Maxillary measurements were all obtained, as were all mandibular metrics. Few non-metric traits could be assessed, the only one showing positive results being presence of the highest nuchal line. Laughlin provides measurements of cranial length and breadth. His cranial length of 171 mm varies from the current rough estimate (180 mm) by 9 mm. His cranial breadth, 145 mm, varies from the current rough estimate (146 mm) by only one millimeter.
Dental Analysis	Maxillary teeth present include all but the left central incisor, missing postmortem, and the left third molar missing due to bone missing at this site. The left third molar is not quite fully erupted. The three present incisors all exhibit shoveling.

Burial #	Fanning #5
OSMA #	11-192
	All mandibular teeth are present. Attrition levels in the maxilla vary from 25-30 in all teeth except the left first molar and the right first and second molars which are at level 40-45. The right third molar is at level 20. Mandibular teeth vary in attrition level from 20 in the third molars, to 40-45 in the first molars. All other teeth are at level 30, except the right second molar at 35.
Pathology/ Anomaly	No pathologies or anomalies are noted. Laughlin noted possible occipital deformation, but this was not confirmed in this study.

Burial #	Fanning #6
OSMA #	11-193
Burial Type	Flexed
Side	Left
Orientation	NE (Laughlin) / Head to East (Edmundson sketch, Collins)
Grave Type	possible pit burial
Associations and Provenience	Antler (or bone) artifact found associated with burial. Burial was surrounded by ash. Fanning #9 remains were associated. Located six feet east and 14 inches south of post, just south of maple tree. Depth was three feet. Bottom of mound was nine inches deeper. This post is along same line as those referenced in Fanning #'s 1-5, but further west of them.
Sex Estimate	Laughlin : Male Collins : none Stepp : Male (crania, pelvis, femoral head)
Age Estimate	Laughlin : Adult Collins : none Stepp : 36-46 years (cranial suture closure)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 7/14/41... "This one was pretty nearly eaten up. Of skull, calvarium and 1/2 mandible are present. Face is entirely gone. No artifacts found. The sole unusual thing was found to be a bone implement about 6 inches long. The end had been rounded to form a handle. This burial was definitely intruded and surrounded by ash." Laughlin : "Very little remained of skeleton No. 6, a large adult male. This burial was surrounded by ash. Associated with it were the bones of an infant, skeleton No. 9, probably but a few months old." Laughlin also mentions this crania exhibits "flattening" and has "ear exostoses."

Burial #	Fanning #6
OSMA#	11-193
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on its left side, with head oriented to either the northeast (Laughlin) or the east (Edmundson sketch). Grave types is possibly a pit type burial based on Edmundson's statement that the burial was "definitely intruded and surrounded by ash." Association with Fanning #9 is not mentioned in notes, but is mentioned in Laughlin (1943).
Preservation and Inventory	Few cranial remains were preserved. Those present include both parietals, the left temporal, and the occipital. Fragmentary cranial elements include the right temporal, and a portion of the left side frontal. The right side of the mandible body and ramus are present but fragmentary. Post-cranial remains are also few and fragmentary. The second third and fifth cervical and two lumbar vertebrae are present. The right innominate exists only as fragmentary iliac blade and acetabulum. The right femur has fragmentary proximal end and diaphysis. The left femur consists of proximal end and fragmentary diaphysis and distal end. The right tibia has fragmentary proximal end and diaphysis. the left tibia has fragmentary ends and diaphysis. One scaphoid bone is present. Three metatarsals and /or metacarpals plus three phalanges are present.
Sex Determination	Sex is determined to be male and is based on several characteristics. Cranial indicators of male include large mastoid processes and a rugged nuchal area. Pelvic indicators of male include a very narrow sciatic notch. Femoral head diameter (left) is 50.6 mm, well within the range for males.
Age at Death	Age at death is determined from cranial suture closure to be between 36 and 46 years. Dental eruption and wear suggest an individual well over 21 years (third molar present with attrition level 55). Epiphyseal union also suggests an individual well beyond 21 years (all epiphyses available are closed, including spheno-occipital synchondrosous. Osteoarthritic lipping of both cervical and lumbar vertebrae, and in the right proximal tibia, suggest advanced age. Finally cranial suture closure has occurred endocranially along the coronal, sagittal and lambdoidal sutures, and ectocranially on the coronal near the sphenoid, and on the lambdoid near the mastoid processes. Age estimation from cranial suture closure is assessed at 36-46 years.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Only maximum breadth, basion-porion, and foramen magnum length could be measured cranially. Only the height of mandible at right side second and third molars could be obtained from the mandible. No maxillary measurements were possible. Few non-metric traits could be assessed, but those showing positive results include an ossicle at asterion on the left side and an auditory torus.

Burial #	Fanning #6
OSMA #	11-193
	The left femur only provided measurement of the maximum head diameter, while the right femur prided mid-shaft diameters and circumference. No other post-cranial metrics were possible. Laughlin provided measures of the height of mandibular symphysis (31 mm) and a bigonial diameter (110 mm) - measurements currently not possible due to the fragmentary nature of the mandible.
Dental Analysis	No maxilla or teeth are present. Mandibular teeth present include only the right third molar. The right second molar is missing antemortem, the right first is missing postmortem and the two premolar sites are missing due to broken alveolus at these sites. All other sites are completely missing. Bone resorption has occurred at the second molar site. Occlusal caries occurs on the third molar. This third molar has attrition level 55.
Pathology/ Anomaly	Auditory tori occur in both auditory meatus. Laughlin refers to these as "ear exostoses." The meatus is nearly closed by the tori. Occlusal caries occurs in the lower right third molar.

Burial #	Fanning #7
OSMA #	11-194
Burial Type	Flexed (Laughlin)
Side	Back (Laughlin)
Orientation	Head to NW (Laughlin)
Grave Type	unknown
Associations and Provenience	Well polished phallic pestle in left hand with head of pestle in place of missing mandible. A fire hearth was found near the head of this burial. Location is not reported.
Sex Estimate	Laughlin : Female Collins : none Stepp : Indeterminate
Age Estimate	Laughlin : Adult Collins : none Stepp : 34-40 (cranial suture closure)
Stature Estimate	1575 mm - 1589 mm
Notes/Observations from previous researchers	Edmundson : There is no mention of this burial in Edmundson's notes. Laughlin : Notes as an adult female and provides some metrics in the notes. Laughlin (1943) states: "Skeleton No. 7 presented the first real difference in method of burial. It was an adult female lying with head northwest-by-west. Instead of lying in the customary flexed position on the side, it lay in a flexed position on the back. In the left hand was a well-polished phallic pestle with its head in place of the missing lower mandible. A fire hearth was near the head of this burial." Collins : "No information except that it was recorded as a disorganized pile of bones and cephalic index 86.3."

Burial #	Fanning #7
OSMA#	11-194
Case Description (Stepp)	Remains are located at OSMA. Burial is not recorded in Edmundson's field notes, although Collins states that it was recorded as a "disorganized pile of bones." It is not clear where Collins got this information. Laughlin describes the burial as flexed, lying on its back, and with head oriented to the northwest (or northwest-by-west) - different than just a pile of bones. Pestle association is interesting and unique, as is the burial position.
Preservation and Inventory	Cranial remains are not well-preserved and those present include only the right parietal. Fragmentary remains include the left parietal, frontal and occipital. Three thoracic, four lumbar vertebrae and the sacrum (four segments) are present. The right innominate consists only of iliac blade, auricular surface and fragmentary acetabulum. The left humerus, radius and ulna are present. The right ulna has proximal end and fragmentary diaphysis. The right radius has distal end and fragmentary diaphysis. One rib fragment is present. The left femur has distal end, diaphysis and fragmentary proximal end. The right femur has fragmentary ends and diaphysis. The right tibia is complete, the left has distal end and fragmentary diaphysis and proximal end. There are ten metatarsal and /or metacarpal bones and sixteen phalanges present. A trapezium, scaphoid, and capitate are present. There is an extra left proximal end of an ulna marked "11-194" but with a tag that reads "#?"
Sex Determination	Sex is indeterminate. The femoral head diameter (right) is 41.1 mm, within the range for females but pelvic traits indicate a possible male (male?) including a medium-narrow sized sciatic notch, and a robust sacrum. There is, however, a slight pre-auricular sulcus. The crania is too fragmentary to be of use.
Age at Death	Age at death is determined to be between 34 and 40 years based on cranial suture closure. All epiphyses available for study are fused suggesting an individual older than 21 years. Slight osteoarthritic lipping in one lumbar vertebrae also suggest advanced age. Cranial sutures are closing endocranially along the sagittal and lambdoidal, and ectocranially along the sagittal near lambda.
Stature	Stature estimates are calculated based on Laughlin's assessment as female. Estimates range from 1575 mm (Genoves) to 1589 mm (Neumann and Waldman). Maximum femoral length is 416 mm (right) and in-position length is 414 mm (right).
Metric and Non-Metric Analysis	No cranial metric analyses are possible. Only a few non-metric traits could be assessed. Some post-cranial measurement was possible. The left femur provided only mid-shaft diameters and circumference while the left provided all measurements. The left innominate was measured for iliac breadth.

Burial #	Fanning #7
OSMA #	11-194
	Laughlin provided measurement of cranial length (168 mm) and breadth (145 mm). The current state of preservation would not allow these measurements.
Dental Analysis	No dental analysis was possible.
Pathology/ Anomaly	Minor osteoarthritic lipping occurs in one of the four lumbar vertebrae present.

Burial #	Fanning #8
OSMA #	11-195
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	A stone maul was found nearby (between skull and pelvis locations). Skull located 2 feet west and 1.5 feet south from fencepost just south of maple tree. Skull was 2.5 feet deep, which is 1.5 feet from the bottom of the mound. Some fragments of vertebrae and pelvis reportedly found 4 feet farther south of skull, and presumed to belong to the same individual.
Sex Estimate	Laughlin : none Collins : Female Stepp : none
Age Estimate	Laughlin : Child (infant in notes) Collins : Mature Stepp : 2-10 years (crania, general size and shape)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 7/30/41...Notes that elbow and "comminuted skull" were found together and that "assorted vertebrae & badly chewed fragments of pelvis" were found just south (4 feet). "I'll try putting skull together. It's very thin, probably an aged female. Mandibular fragment shows 1 tooth only." Laughlin : in notes... "Proved to be an infant" i.e. not an aged female.

Burial #	Fanning #8
OSMA#	11-195
Case Description (Stepp)	Remains are located at OSMA. There are no notes indicating burial attributes of the interment. There is non-specific locational information. Edmundson suggests the burial is that of an aged female, and Collins reiterates this. Laughlin, however, assesses the individual as an "infant" (in notes) or a child (Table 1, 1943). It is unclear why Collins continued to refer to this as a mature female when Laughlin's note is written onto Edmundson's text. Current study confirms the individual as a child.
Preservation and Inventory	Cranial remains present include only the left parietal and left temporal. Fragmentary remains include the right parietal, right temporal, frontal, occipital and sphenoid. The mandible is missing. No post-cranial remains are present, although Edmundson mentions the "elbow" and "assorted vertebrae" and "pelvis" were present but "badly chewed."
Sex Determination	No sex determination is made. Edmundson (and then Collins) assessed the individual as an aged female based on the very thin skull.
Age at Death	This thin skull now appears to be that of a young child. Best guess is in the age range of 2-10 years, although remains are quite fragmentary.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Maximum length and minimum frontal breadth were the only measurements possible. Very few non-metric traits were assessable, but those showing positive result include the presence of an ossicle at lambda and the presence of a frontal notch or foramen (although the individual is young and this trait may change with age).
Dental Analysis	No dental analysis is possible. Edmundson did mention that one tooth survived in the mandible - both are now missing.
Pathology/ Anomaly	The crania is slightly asymmetric, the right occipital bulging more than the left. This may be post-depositional deformation and not artificial. There is an extra ossicle at the lambda (an Inca bone).

Burial #	Fanning #9
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	Associated with Fanning #6. Fanning #6 is listed as being located six feet east and 14 inches south of post, just south of maple tree. Depth was three feet. Bottom of mound was nine inches deeper. This post is along same line as those referenced in Fanning #'s 1-5, but further west of them.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : Infant, few months old Collins : Infant, few months old Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : Has no notes for this individual. Laughlin : In discussing #6... "Associated with it were the bones of an infant, skeleton No. 9, probably but a few months old."

Burial #	Fanning #9
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. No information is recorded in notes regarding this individual, except a notation (by Laughlin) that the individual was fragmentary. The association with Fanning #6 is not mentioned in notes, but is mentioned in Laughlin (1943). Locational information is inferred from #6.
Preservation and Inventory	Only noted as fragmentary.
Sex Determination	No sex determination was made.
Age at Death	Age at death was assessed as "infant" by Laughlin.
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric or non-metric analyses were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #10
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts were found with this individual. Location is to the east of Fanning #11, which is six feet south of #1.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : 11/3/41... "The last time you and I dug at Fannings we found a number of bones. My next dig was just to the west, and included enough additional bones, mostly fragmentary, that I considered enough had been found to comprise an individual, no artifacts." Laughlin : Only a single notation on this burial (by Laughlin) that it is "fragmentary." Collins : "No information except 'just a collection of bones'."

Burial #	Fanning #10
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. No information on burial attributes is recorded in the notes except that it is located just east of #11. Laughlin simply lists as "fragmentary." Collins has a quote of "just a collection of bones" the origin of which is unknown.
Preservation and Inventory	Laughlin simply mentions fragmentary, while Collins suggests there are at least several bones ("a collection") preserved.
Sex Determination	No sex determination was made.
Age at Death	No age determination was made.
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric or non-metric analyses were made.
Dental Analysis	No dental analyses were made.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #11
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations	No artifacts were found associated. Location is six feet south of Fanning #1, and just west of Fanning #10. Depth was 29 inches.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 9/25/41... "...we found the maxilla, a fragmentary mandible, a fragmentary humerus, radius, fibula, and tibia. Numerous phalanges, 2 patellas and some vertebrae also appeared. Since the parts of the skull found were approximately those missing from Fanning #1, barely 6 feet distant it is impossible to state at present whether this is Fanning #11 or not. There were no associated artifacts. Depth was 29 inches." "Later... I washed up the scraps. There is a piece of occipital bone, which I believe was present in Fanning #1. There is also a few pieces of parietal also present in Fanning #1. To add confusion are 2 fragmentary clavicles, both small, and of different size. The teeth show considerable wear. The angle of the jaw is of a non-senile adult, one tooth has its root destroyed by an apical abscess. Another has a bulbous cracun."

Table 19. cont.

Burial #	Fanning #11
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. The notes on this individual are quite confusing -as were the excavators by self-admission. From study of the notes several possibilities arise - these remains contain parts of Fanning #1, they contain parts of several individuals that may or may not include Fanning #1, they are a single individual comprising Fanning #11 only. Without analysis of the remains and more information on provenience the likelihood of deciphering this confusion is small.
Preservation and Inventory	Remains are described as fragmentary. Elements listed as present in the notes include the maxilla, a fragmentary mandible, a fragmentary humerus, radius, fibula, tibia, numerous phalanges, two patellas and some vertebrae. Also listed are parts of the crania including occipital and parietal bones. Two small and differently sized clavicles are also mentioned. No remains are currently present.
Sex Determination	No sex determination was made.
Age at Death	Age at death is noted by Edmundson to be "non-senile adult" based on the "considerable wear" of the teeth and the jaw which shows an angle of a "non-senile adult."
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	No metric or non-metric analyses were made.
Dental Analysis	Both maxilla and fragmentary mandible were found. The teeth are noted as showing "considerable wear." The angle of the mandible is that of a "non-senile adult" suggesting no deformation due to tooth loss and bone resorption. One tooth is noted as having its "root destroyed by an apical abscess" and another tooth has a "bulbous cracun."
Pathology/ Anomaly	The only pathologies mentioned are the tooth abscess and the "bulbous cracun" of another tooth.

Burial #	Fanning #12
OSMA #	11-196
Burial Type	Flexed (Edmundson sketch)
Side	Right (Edmundson sketch)
Orientation	West (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	A pestle and sandstone disc with shallow pecked center depression were found with burial. Fanning #2 was buried directly above this individual. Located 4 feet west and 6 feet south of a post along fenceline, east of maple tree. Depth was 38 inches.
Sex Estimate	Laughlin Male Collins : none Stepp : Male (crania, pelvis)
Age Estimate	Laughlin : Young adult Collins : none Stepp : 20-21 years (dentition, epiphyses)
Stature Estimate	1688 mm - 1704 mm
Notes/Observations from previous researchers	Edmundson : Notes of 10/20/41... while digging for rest of Fanning #2 remains... "...in going around it (#2) he ran into and somewhat damaged another skeleton. Skull has not been reconstructed, but is very fragmentary, and over half gone. However, some things are apparent. The closed epiphyses, slightly worn teeth, and sharp angle of the jaw indicate a young adult. Pelvis and 18 inch femur indicate a large male." "It will probably be impossible to sort out all bones of the two skeletons (i.e. #12 and #2). You will note that the pelves were superimposed, #2 being a little shallower than the recent find." Notes of 10/21/41... "Fanning #12 - Skull definitely too fragmentary to reconstruct. Laughlin : in notes.. "peculiar torsion of right femur"

Burial #	Fanning #12
OSMA#	11-196
Case Description (Stepp)	Remains are located at OSMA. Burial attributes were note reported in Laughlin or Collins but Edmundson's sketch in the notes show a flexed burial, on its right side, with head oriented to west (slightly NW). Grave type is unknown. This burial was directly beneath Fanning #2, but real association of the two burials is not demonstrated. In fact the two burials are oriented in different directions, and only the pelves are in contact (although it sounds like some mixing of other bones has occurred). It seems likely that #2 was intrusive into the earlier burial #12.
Preservation and Inventory	The crania is fragmentary. Complete elements present include only the left parietal. Fragmentary elements include the right and left temporals, the maxilla (left side), the left portion of the frontal, and the basi-occipital. The left side of the mandible is present. Post-cranial elements are also fragmentary although several whole bones are present. The first and one other cervical, five thoracic, and five fragmentary lumbar vertebrae are present. The sacrum is fragmentary with three upper segments present. The right innominate consists only of fragmentary iliac blade and acetabulum, while the left has only fragmentary ilium (all portions). The right humerus is present. The left radius and ulna are present. The right radius has proximal end and diaphysis. The right ulna has proximal end with fragmentary diaphysis. The right scapula consists of glenoid fossa, spine and fragmentary corocoid process and acromion. The right clavicle is present, but with unfused epiphyses. Thirteen rib fragments are present. The right femur consists of a diaphysis with fragmentary ends, the left has distal end and fragmentary diaphysis. The right tibia has distal end and fragmentary diaphysis. The left fibula has distal end and diaphysis present. The left and right talus are present. The left calcaneus is fragmentary. Four phalanges are present. There are several extra elements labeled "11-196" that may belong to Fanning #2 (11-188, which was buried just above this individual) including a right acromial process from scapula, a left shovel-damaged and rodent gnawed diaphysis of femur, an unsided fragment of femur diaphysis, an extra proximal end of right humerus and an extra distal end of right humerus. In fact all of these elements are missing from 11-188.
Sex Determination	Sex is determined to be male based on both cranial and pelvic traits.Cranial traits indicating male include large mastoid processes and a squarish gonial angle. Pelvic traits indicating male include a very narrow sciatic notch, and a generally large, robust morphology. A very shallow pre-auricular sulcus is present. Laughlin also assesses the individual as male.
Age at Death	Age at death is determined to be about 20-21 years. All third molars are fully erupted and show slight wear (20), suggesting the individual is past about 20 years. However, the spheno-occipital synchondrosous is not fused suggesting the individual is not past about 21 years. The epiphyses of the clavicle are also not fused.

Burial #	Fanning #12
OSMA #	11-196

Stature

Stature is estimated between 1688 mm (Neumann and Waldman) and 1704 mm (Trotter and Gleser). Genoves formula gives and estimate of 1692 mm. Maximum morphological length of the femur is 455 mm and in-position length is 450 mm. Laughlin also measured femoral length at 455 mm.

Metric and Non-Metric Analysis

No cranial metrics were possible. Maxillary measurements include all but the palate length, although internal and external breadths were taken by measuring the left half and doubling the result. Mandibular metrics obtained include those of the left side only, and the total length. Few non-metric traits were assessable.

Measurement of the innominates included only the right side cotylo-sciatic breadth. The right femora provided all metrics except femoral head diameter, while the left provided only mid-shaft diameters and circumference. Laughlin provided a measure of femoral length of 455 mm matching the current right side result.

Dental Analysis

Only a portion of the left side of the maxilla is present. Maxillary teeth present include the two left incisors (although alveolus is missing and teeth are loose), the left first premolar, and the three left molars. The right lateral incisor and third molar are also present - although no maxilla is present at these sites. The left canine and second premolar are missing postmortem.

Only a portion of the left side of the mandible is present. Mandibular teeth present include only the three left molars. The left canine and premolars are missing postmortem. The left incisors are missing due to broken and missing alveolus at these sites. All right side sites are missing.

The three maxillary incisors present all exhibit shoveling.

Attrition level varies from a low of 20 at the third molars, to 25 in the upper left incisors and canine, 30 in the upper right lateral incisor, 35 in the lower left second molar, 40 in the upper left second molar, and 60 in the left first molars.

The upper left first premolar is rotated in its socket by 90 degrees, the buccal side now pointing mesially.

Pathology/ Anomaly

The upper left first premolar is rotated in its socket as just mentioned.

Laughlin mentions a "peculiar torsion of right femur" not noticed in the current study.

Burial #	Fanning #13
OSMA #	11-197
Burial Type	Flexed (Edmundson sketch)
Side	Right (Edmundson sketch)
Orientation	Head to west (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	No artifacts found associated with Fanning #13. Located 7.5 feet south of fence, and west (distance unknown) of post referenced with #2 and #12, but still east of maple tree. Depth was 26 inches.
Sex Estimate	Laughlin : Male (male? in notes) Collins : none Stepp : Male (crania)
Age Estimate	Laughlin : Adult (in notes) Collins : none Stepp : 37-47 (cranial suture closure)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 10/20/41... "Fanning #13's radius measures 8 1/2 inches, therefore a short individual. Skull is thick and typically Kalapooya. It can be measured. Sex is probably female. There were no artifacts. No lower jaw was found. In fact, most of the bones save a humerus and a radius are eaten up, by rodents. No pictures taken." 10/21/41... "Fanning #13 Calvarium intact : cephalic index 78.3. Face entirely gone save for worn tooth. Fragments of animal skull are left when reconstruction was finished : their source is unknown." Laughlin : assesses as adult male?.

Table 19. cont.

Burial #	Fanning #13
OSMA#	11-197
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on right side with head oriented to the west, according to a sketch in the notes. The grave type is unknown and only a non-specific provenience is given.
Preservation and Inventory	Few cranial remains are intact but include complete left and right parietals, and both temporals. The frontal, occipital and sphenoid are fragmentary. The maxilla and mandible are missing. Few post-cranial remains are preserved. Two thoracic vertebrae are present. The right humerus is present, while the left consists only of distal end and diaphysis. The right radius is present, while the left consists only of proximal end and fragmentary diaphysis. Both ulnae have proximal ends present and fragmentary diaphyses. The left clavicle has a complete lateral end and fragmentary proximal end and diaphysis. The right tibia has proximal end and fragmentary diaphysis. There is one metatarsal or metacarpal and one phalange present.
Sex Determination	Cranial remains indicate the individual was male. Cranial traits indicating male include large mastoid processes, a very large nuchal crest (occipital bun), a slight brow ridge prominence, and dull supraorbital ridges. Laughlin also assessed the individual as male.
Age at Death	Age at death is determined to be between 37-47 years based on cranial suture closure. The coronal and sagittal sutures have closed endocranially. The coronal suture has nearly closed ectocranially near the sagittal. The sagittal is nearing obliteration near the coronal and lambdoidal sutures. All epiphyses available for study are of course closed. Laughlin assessed the individual as "adult."
Stature	No stature estimate was possible.
Metric and Non-Metric Analysis	Few cranial metrics were possible but those obtained include cranial length and breadth, minimum frontal breadth, both porion-nasion, and maximum frontal breadth. Both basion and prosthion are missing and nasion is estimated. Many non-metric traits were obtainable but those not assessable include especially those of the basi-occipital, the maxilla and ethmoid. Laughlin provided measurements of cranial length and breadth. His length varied from the current by one millimeter. The breadth result varies by 10 millimeters (138 mm compared to the current 148 mm). This large discrepancy is unexplained. No post-cranial metrics were possible.
Dental Analysis	The maxilla and mandible are both missing. No teeth are present. Location of Edmundsons "one worn tooth" is unknown.

Burial #	Fanning #13
OSMA #	11-197
Pathology/ Anomaly	No pathologies are noted. There is a slight asymmetry to the skull. The right posterior half of the occipital bulges more than the left.

Burial #	Fanning #14a
OSMA #	11-198a
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	Associations are unknown, but green stain on zygomatic suggests a copper item had been buried with this individual, and possibly with Fanning #14b, and #14c, as the bones are mixed and have the same accession number. Provenience is unknown.
Sex Estimate	Laughlin : none Collins : none Stepp : none
Age Estimate	Laughlin : none Collins : none Stepp : 12-14 years (dentition, epiphyses)
Stature Estimate	none (too young)
Notes/Observations from previous researchers	There are no notes for this burial. There are notes for a "Fanning #14" believed to be #14c (11-198c) in this study - see that individual.

Burial #	Fanning #14a
OSMA#	11-198a
Case Description (Stepp)	Remains are located at OSMA. There are three individuals labeled Fanning #14 and 11-198. They are here, labeled as #14a (11-198a, #14b (11-198b), and #14c (11-198c). There are notes on a Fanning #14, but they refer to an infant - see Fanning #14c. Fanning #14a, an adolescent, has no information available.
Preservation and Inventory	The skull is well-preserved. Cranial elements present include both parietals, both temporals, the maxilla, both malar, the palatine, frontal, occipital and sphenoid. The mandible is missing. Post-cranial remains are less well-preserved. The second and one more cervical, four thoracic, and five lumbar vertebrae are present. The first sacral vertebrae and intact auricular surfaces are present. The left innominate has a complete ilia and fragmentary pubis, while the right has complete ilia and fragmentary pubis and ischium. The right humerus consists of distal end and diaphysis. The right radius consists of proximal end only. The right ulna has proximal end and diaphysis, while the left consists of proximal end, diaphysis and the distal epiphysis. Four ribs are present. The right femur is complete, while the left consists of proximal end and diaphysis. Both patellae are present. The right tibia is complete. There is an unsided fibula with complete diaphysis and fragmentary epiphyseal ends. There are several post-cranial elements that are much larger and belong to a different individual, but labeled 11-198 along with these remains (11-198a). They belong to 11-198b and are listed under their own description sheet - see next burial, Fanning #14b.
Sex Determination	No sex determination is made for this adolescent individual.
Age at Death	Age at death is determined to be 12-14 years based on dental eruption and wear, and epiphyseal union. Maxillary teeth only are present. All molars can be seen, the firsts are fully erupted, the seconds are very close to full eruption and show slight wear (20), while the thirds are not erupted. This indicates an individual 12-14 years of age. Many epiphyses are not yet fused including the distal ulna, proximal and distal fibula, iliac crest, and the femoral epiphyses.
Stature	No stature estimate is made since no sex determination could be made and the formulae for stature are created for adult individuals. Femoral length is 365 mm (right) and in-position length is 361 mm (right).
Metric and Non-Metric Analysis	All cranial measurements were possible except the bizygomatic (arches broken). The orbital heights and breadths are affected by loosely fitting bones, but are closely estimated. All maxillary metrics were obtained. The mandible is missing. Most cranial non-metric traits were assessable.

Burial #	Fanning #14a
OSMA #	11-198a
	Post-cranial metrics were possible. The right femur yielded all measurements, the left all but the two lengths. The innominates yielded only iliac breadth and cotylo-sciatic breadth.
Dental Analysis	Maxillary teeth only are present and include all six molars and the left second premolar. All other teeth (incisors, canines and premolars) are missing postmortem. The left second premolar is fully erupted and shows an attrition level of 20. The first molars are fully erupted and show attrition level 25. The second molars are almost fully erupted and show attrition level 20. The third molars are not yet erupted, but are visible through the alveolus.
Pathology/ Anomaly	The individual exhibits artificial fronto-occipital cranial deformation. The skull also shows a slight asymmetry, the right side occipital bulging more than the left. There is an extra ossicle just to the right of (adjacent to) the landmark lambda. There are also two small extra ossicles on the left side lambdoid suture and two small ossicles on the left side coronal suture. There is a green stain on the left zygomatic bone, indicating some copper artifact had been buried with this individual. Again the association of trade items with cranially deformed individuals is noted.

Burial #	Fanning #14b
OSMA #	11-198b
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	Associations are unknown - but possibly with Fanning #14a, and #14c as the bones are mixed and have the same accession number. Provenience is unknown.
Sex Estimate	Laughlin : none Collins : none Stepp : none
Age Estimate	Laughlin : none Collins : none Stepp : > 18 years (epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	There are no notes for this burial. There are notes for a "Fanning #14" believed to be #14c (11-198c) in this study - see that individual.

Burial #	Fanning #14b
OSMA#	11-198b
Case Description (Stepp)	Remains are located at OSMA. There are three individuals labeled Fanning #14 and 11-198. They are here, labeled as #14a (11-198a, #14b (11-198b), and #14c (11-198c). There are notes on a Fanning #14, but they refer to an infant - see Fanning #14c. Fanning #14b, an adult, has no information available.
Preservation and Inventory	No cranial remains are preserved. Post-cranial remains are few but include three thoracic and three lumbar vertebrae present. There is also the upper portion of a sacrum present. The manubrium is present. Both patellae are present. The left and right calcaneus are present, and one talus and five other tarsals are present. A first metatarsal plus ten other metatarsals and /or metacarpals are present. One hamate is present. Six phalanges are present. These remains were all mixed in with those of 11-198a - and all are labelec 11-198. They were easily separable, however, based on adult versus adolescent size.
Sex Determination	No sex determination could be made.
Age at Death	All epiphyses available for study are fused, suggesting an individual at least over 18 years, probably over 21. The sacrum typically fuses between 18-25 years, the vertebral bodies between 17-25 years.
Stature	No stature estimate was possible.
Metric and Non-Metric Analysis	No metric analyses were possible.
Dental Analysis	No dental analyses were possible.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #14c
OSMA #	11-198c
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts found with this individual. Possibly buried with #14a, b. Location is unknown but it is mentioned that the burial is "a little north and slightly west" of something and that another "child's skull" was recovered just north of the present bones. Depth was 41 inches. Fanning #'s 8 and 9 are the only other "children", #9 was associated with #6, location of #8 is unknown.
Sex Estimate	Laughlin : none Collins : none Stepp : none
Age Estimate	Laughlin : none Collins : none Stepp : 18 months - 2 years (dentition)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 10/25/41... "A little north and slightly west at 41 inches level were a number of epiphyses of small hand or foot bones, and the face of a very small skull. Possibly these belong with the child's skull previously recovered just north of the present bones. Only a trip to Salem will tell." Notes of 11/3/41... "Fanning #14 ? Shows the supraorbital part of frontal, a temporal, the maxilla, and part of the foramen magnum plus parts of eth(moid?) and sphenoid. A scapulla (sic) is also present. What I previously called epiphyses of hand bones are buds of unerupted teeth. May be part of the previous infant skeleton, but probably is not. No artifacts." Notes of 11/15/41... "Fanning 14 is not the child previously reported, but is a separate individual."

Burial #	Fanning #14c
OSMA#	11-198c
Case Description (Stepp)	Remains are located at OSMA. There are three individuals labeled Fanning #14 and 11-198. They are here, labeled as #14a (11-198a, #14b (11-198b), and #14c (11-198c). There are notes on a Fanning #14 that refer to an infant assumed to be the individual discussed here (Fanning #14a is adolescent, #14b is adult). There is little information on burial attributes but a very non-specific location and depth is recorded. No associations were found. The remains, as mentioned by Edmundson are probably not part of the previous child's skull (either #8 or #9) as there are repeated elements of #8 present here, and nothing present of #9 (which was associated with #6).
Preservation and Inventory	Cranial remains are very few and fragmentary. The supraorbital and a portion of squamous fragment of the frontal is present, fragmentary maxilla, and small fragments of temporal and parietal, and other small unidentifiable cranial fragments are present. Post-cranial elements present include only the distal portion of the right humerus and one phalange.
Sex Determination	No sex determination is made from these remains.
Age at Death	Age at death is determined to be between 18 months and 2 years based on the presence of an erupted upper left deciduous first molar. Second deciduous molar caps are present but are not fully formed and probably were not erupted.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Few cranial metrics were possible, but included nasal breadth, orbital breadths, a nd biorbital breadth. Maxillary measurements include palate breadth (internal and external), and superior alveolar length. Non-metric traits were not assessable. No post-cranial metrics were obtained.
Dental Analysis	Only the maxilla is present. Maxillary teeth present include the left deciduous first molar, which is fully erupted, and shows no wear (the individual would still have been nursing). There are three other molar caps (probably all second deciduous molars) present - none of which are fully formed and were probably not erupted. (It is possible that these were erupted and just did not have complete root formation, as is often the case in deciduous molars). All incisors and canines are missing postmortem. These sites all appear to have had erupted teeth in them.
Pathology/ Anomaly	No pathologies were noted. The frontal bone is slightly twisted probably due to post-depositional deformation.

Burial #	Fanning #15
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown Provenience unknown
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	none
Notes/Observations from previous researchers	There are no notes on this individual except one notation (by Laughlin?) that burial was "fragmentary."

Burial #	Fanning #15
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. No information recorded in the notes for this individual, except one notation by Laughlin that the burial was "fragmentary."
Preservation and Inventory	Burial recorded as "fragmentary" by Laughlin.
Sex Determination	No sex determination was made.
Age at Death	No age at death was determined.
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric or non-metric analyses were made.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #16
OSMA #	none
Burial Type	Flexed? (Edmundson sketch)
Side	Right? (Edmundson sketch)
Orientation	SW? (Edmundson sketch)
Grave Type	Pit (Edmundson notes)
Associations and Provenience	Associated with #17 (infant) found at knees. Also a broken camas digger, and oval mortar were found. Location is 10 feet east and 14.5 feet south of post which is just south of maple tree. Depth was 36 inches below surface and 8-10 inches above bottom of mound strata.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 3/29/42... "...a 3-6 inch layer of ash appeared throughout the 6 foot hole at about 30 inches deep except just above the burial, where it was missing. Butt half of a small camas digger broken through the hole just at the level of and 6 inches south of the knees, about 1 foot west of a little shallower oval mortar 6 inches in diameter & 2 3/4 inches high : hence quite shallow. The rim has been slightly battered for 1/3 its circumference, & the bottom has been flattened a little by pecking. It sat right side up, but contained nothing. This skeleton was very fragmentary. We have 2-3 pieces of skull, a scapula (sic), a few vertebrae, the end of a fibula (sic), a talus, a calcaneus, & the femurs and tibiae, mostly incomplete. The bones are adult, & small: probably female." "A temporal bone & a few others of an infant occurred in the region of the bowl. Tho very fragmentary, we designate this #17."

Burial #	Fanning #16
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. The sketch in Edmundson's notes is difficult to decipher but appears to be an individual lying flexed on its right side with head oriented to the southwest. The notes also indicate a pit type burial, intrusive through a layer of ash. Edmundson cursorily calls the remains "female" based on their small size. He also notes them as "adult." The remains are associated with the remains of an infant, found at the knees of the adult.
Preservation and Inventory	Remains are noted as very fragmentary, but apparently included 2-3 pieces of skull, a scapula , a few vertebrae, the end of a fibula , a talus, a calcaneus, and fragments of the femurs and tibiae. No remains are currently present at OSMA.
Sex Determination	Edmundson assesses the individual as "female" based on small size of remains.
Age at Death	Edmundson notes the remains are those of an "adult."
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric analyses were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fanning #17
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	Pit (Edmundson notes)
Associations and Provenience	Was found at the knees of Fanning #16. Also a broken camas digger, and oval mortar were found. Location is 10 feet east and 14.5 feet south of post which is just south of maple tree. Depth was 36 inches below surface and 8-10 inches above bottom of mound strata.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 3/29/42...in discussing #16 "...a 3-6 inch layer of ash appeared throughout the 6 foot hole at about 30 inches deep except just above the burial, where it was missing. Butt half of a small camas digger broken through the hole just at the level of and 6 inches south of the knees, about 1 foot west of a little shallower oval mortar 6 inches in diameter & 2 3/4 inches high : hence quite shallow. The rim has been slightly battered for 1/3 its circumference, & the bottom has been flattened a little by pecking. It sat right side up, but contained nothing. This skeleton was very fragmentary. We have 2-3 pieces of skull, a scapulla (sic), a few vertebrae, the end of a fibulla (sic), a talus, a calcaneus, & the femurs and tibiae, mostly incomplete. The bones are adult, & small: probably female." "A temporal bone & a few others of an infant occurred in the region of the bowl. Tho very fragmentary, we designate this #17."

Table 19. cont.

Burial #	Fanning #17
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown. Very little information is recorded for this individual. It is associated with #16 which has a non-specific provenience reported and is probably a pit burial, intrusive through a layer of ash. The remains are noted as an "infant" by Edmundson and were found at the knees of the adult (#16).
Preservation and Inventory	The remains are noted by Edmundson to be very fragmentary and included only "a temporal bone and a few others."
Sex Determination	No sex determination was made.
Age at Death	Age at death is noted as "infant."
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	No metric or non-metric analyses were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were reported.

Burial #	Fanning #18a
OSMA #	11-199a
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	Laughlin lists a mortar as found with this individual. provenience unknown
Sex Estimate	Laughlin : none Collins : none Stepp : Male (crania, pelvis)
Age Estimate	Laughlin : none Collins : none Stepp : 40-46 (cranial suture closure)
Stature Estimate	1586 mm - 1632 mm
Notes/Observations from previous researchers	There are no field notes on this burial, except a single notation that burial was "fragmentary.". Laughlin : Lists only a cranial index of 83.5, and an associated "mortar" found with burial.

Burial #	Fanning #18a
OSMA#	11-199a
Case Description (Stepp)	Remains are located at OSMA. There are no field notes on this burial, other than a single notation that burial was "fragmentary." Laughlin (1943) lists an associated mortar found with this burial, and provides a cranial index of 83.5. There are two individuals labeled as Fanning #18 (11-199), distinguished here by "a" and "b." This is 11-199a, an adult, and assumed to be the individual Laughlin records, as it is the only one of the two that has cranial remains, and Laughlin records a cephalic index - although this crania is too fragmentary at present to obtain this index.
Preservation and Inventory	Cranial remains are fragmentary. Only the parietals are complete. Fragmentary remains include the maxilla, frontal, and occipital. The mandible is complete. Post-cranial remains are few and fragmentary. The second cervical vertebrae is present. The right innominate consists of fragmentary iliac blade and acetabulum, while the left consists of complete ilium with fragmentary ischium. The right humerus consists of distal end and diaphysis, the left of diaphysis with fragmentary distal end, and there is an unsided humeral head. The radii consist of the distal end from both sides only. The left ulna consists of proximal end and fragmentary diaphysis. The right femur is complete, the left has distal end and diaphysis. The right tibia is represented by a fragmentary distal end only, and the left has distal end and half of the diaphysis. The right talus is present. There is an extra right diaphysis of femur and an extra left proximal ulna marked 11-199 but obviously belonging to a different individual.
Sex Determination	Sex is determined to be male, based on pelvic and cranial morphology. Pelvic traits indicating male include a narrow sciatic notch. There is no pre-auricular sulcus. Cranial traits indicating male include large mastoid processes and a heavy nuchal crest and occipital bun. Femoral head diameter is, however, only 42.8 mm (right), in the range for probable female (female?) - although it is noted that more females than expected were found for this population by this method and it seems likely that males have smaller head diameters than this technique suggests.
Age at Death	Age at death is determined to be 40-46 years based on cranial suture closure. All teeth are erupted and epiphyses closed indicating an adult individual. Dental wear levels of 70 at the upper first and second molars, and extensive tooth loss and bone resorption in the mandible suggest advanced age. The lambdoidal and coronal sutures are nearing complete closure ectocranially, indicating an age in the 40's.
Stature	Stature estimates range from 1586 mm (Genoves), to 1603 mm (Trotter and Gleser), to 1632 mm (Neumann and Waldman). Maximum morphological length of the femur (right) is 408 mm, while in-position length is 401 mm.

Burial #	Fanning #18a
OSMA #	11-199a
Metric and Non-Metric Analysis	Maximum breadth is the only cranial metric obtainable. No maxillary measurements could be taken. All measurements of the mandible were completed although slight breakage at the front of the symphysis has affected total length, and extensive bone resorption has affected results of the height of the mandible body at both premolar and molar sites. Most non-metric traits were not assessable, especially those of the face and basi-occipital. Some post-cranial measurement was possible. The right femur provided all measurements, while the left was measured only for mid-shaft diameters and circumference. The innominates provided only measurement of the right cotylo-sciatic breadth.
Dental Analysis	Maxillary teeth present include only the right first, second, and third molars. All other sites are missing. The first and second molars have attrition level of 70, the third is at 30. The entire mandible is present but all teeth are missing. The second premolars and all molars are missing antemortem with bone resorption at all these sites. The incisors, canines and first premolars are all missing postmortem.
Pathology/ Anomaly	There is an extra ossicle at the lambda. It is offset slightly to the right of the midline.

Burial #	Fanning #18b
OSMA #	11-199b
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown provenience unknown
Sex Estimate	Laughlin : none Collins : none Stepp : Male (pelvis, femoral head)
Age Estimate	Laughlin : none Collins : none Stepp : > 21 years (epiphyses)
Stature Estimate	1660 mm - 1680 mm
Notes/Observations from previous researchers	There are no field notes on this burial.

Burial #	Fanning #18b
OSMA#	11-199b
Case Description (Stepp)	Remains are located at OSMA. There are no field notes on this burial. There are two individuals labeled as Fanning #18 (11-199), distinguished here by "a" and "b." This is 11-199b, an adult, and assumed not to be the individual Laughlin records, as it has no cranial remains, and Laughlin records a cephalic index for Fanning #18.
Preservation and Inventory	No cranial remains are present with this individual. Post-cranial remains are relatively complete. The first and second plus two more cervical, one thoracic and two lumbar vertebrae are present. The superior portion of the sacrum is present. The innominates are both represented by only fragmentary ilia (all portions). The right humerus consists of proximal and distal ends, the left of proximal end, diaphysis and fragmentary distal end. The right radius is complete, while the left has proximal end and fragmentary diaphysis. The left ulna is complete, while the right has proximal end and fragmentary diaphysis. Both scapulae have intact glenoid fossae, and fragmentary spines and acromions. The left clavicle is represented by fragmentary lateral end and diaphysis. There are eleven rib fragments. Both femora are complete. The right patella is present. Both tibia are complete. There is an unsided fragment of proximal end and an unsided fragment of diaphysis of fibula. A right talus and unsided first metatarsal present. There are two metacarpals and three phalanges present.
Sex Determination	Sex is determined to be male based on pelvic morphology and femoral head diameter. Pelvic traits indicating male include a very narrow sciatic notch. There is no pre-auricular sulcus present. Femoral head diameter of the right side is 45.6 mm, within the range for male individuals, and for the left is 44.6 mm, within the range for probable males (male?).
Age at Death	Age at death is determined to be greater than 21 years, as all epiphyses available for study are fused.
Stature	Stature estimates vary from 1660-1667 mm (Genoves), to 1676 mm (Neumann and Waldman), and to 1673-1680 mm (Trotter and Gleser. Maximum morphological lengths of the femur are 441 mm (left) and 444 mm (right), while in-position length are 440 mm (left and right).
Metric and Non-Metric Analysis	No cranial metrics or non-metrics were possible. Post-cranially, both femora provided all measurements. The innominates were both measured for iliac breadth only.
Dental Analysis	No dental analyses could be performed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #1
OSMA #	none
Burial Type	flexed (Laughlin) / indeterminate (Collins)
Side	Left
Orientation	Head to S (Laughlin) / NW (Collins)
Grave Type	Pit (Collins)
Associations	Near Fuller #'s 2, 3 Shell (Olivella, Dentalium, Littorina) and bone beads around legs and pelvis (Edmundson). Laughlin says beads around neck.
Sex Estimate	Laughlin : none Collins : indeterminate Stepp : not available for study
Age Estimate	Laughlin : adolescent Collins : adolescent Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : "...found a skeleton of an adolescent by hitting its knee." "That meant essentially digging to the depth of a shovel handle..." "The skull was gone except for teeth and fragment of mandible. All bones and artifacts were collected in one heap." Laughlin : Found within 120 cm radius of Fuller #'s 2, 3. Bones badly disintegrated. Collins : Fair preservation but incomplete, skull missing, mandible fragment and teeth recovered.

Burial #	Fuller # 1
OSMA#	none
Case Description (Stepp)	Current location of remains unknown, not at OSMA. No analysis other than from previous research could be completed. Burial was apparently flexed and lying on left side but orientation is uncertain. Edmundson has drawing in field notes showing a flexed burial near a "south fence" and lying on left side with head oriented to northwest as in Collins.
Preservation and Inventory	Apparently teeth and a mandible fragment were discovered, but rest of skull was missing. Post-cranial remains were not mentioned in field notes.
Sex Determination	No sex determination.
Age at Death	Field notes, Laughlin and Collins state only that individual was an "adolescent."
Stature	No stature determination.
Metric and Non-Metric Analysis	No metric analysis completed.
Dental Analysis	No dental analysis completed.
Pathology/ Anomaly	No pathology discussed in field notes or otherwise.

Burial #	Fuller #2
OSMA #	none
Burial Type	Flexed
Side	Right
Orientation	Head to SE (Laughlin) / SW (Collins)
Grave Type	Pit (Collins)
Associations	Near Fuller #1. Shell (Olivella, Littorina, Dentalium) and bone beads as leg and neck decorations. Collins says no associations, and none are mentioned in Edmundsons field notes.
Sex Estimate	Laughlin : none Collins : indeterminate Stepp : not available for study
Age Estimate	Laughlin : adolescent Collins : adolescent Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : while digging near #1..."came on #2 at the same depth, likewise adolescent. Only a few teeth and fragmentary bones presented themselves." Laughlin : Within 120 cm radius of Fuller #'s 1, 3. Bones badly disintegrated. Collins : Poor preservation, incomplete skeleton. Located 5 feet from surface.

Burial #	Fuller #2
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. No analysis other than from previous research could be completed. Burial was flexed and lying on its right side. Edmundson shows a drawing of burial with head to southwest as in Collins, and lying just northwest of Fuller #1. Uncertain whether associated artifacts were present as Edmundson does not mention, Collins says none, but Laughlin says yes.
Preservation and Inventory	Burial apparently not well-preserved as Edmundson states only "a few teeth and fragmentary bones" were found.
Sex Determination	No sex determination.
Age at Death	Edmundson, Laughlin and Collins all list as "adolescent."
Stature	No stature determination was completed.
Metric and Non-Metric Analysis	No metric or non-metric analyses completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathology mentioned in notes.

Burial #	Fuller #3
OSMA #	none
Burial Type	Flexed
Side	Right
Orientation	SW (Laughlin) / NW (Collins)
Grave Type	Pit (Collins)
Associations	Near Fuller #'s 1, 2. Shell (Olivella, Pelecopod, Dentalium, Turtella) and many bone beads, copper bangles, copper button, red chert drill, agate and obsidian points, unidentified bone artifacts. Sterile ash above and west of head.
Sex Estimate	Laughlin : Female Collins : Female Stepp : not available for study
Age Estimate	Laughlin : adolescent Collins : adolescent Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : digging north of #2...."hit the right maxilla of #3, likewise an adolescent, and excellently preserved." "All bones and artifacts were collected separately. This burial was one foot more shallow" (than #1 and 2). Laughlin : Within 120 cm radius of Fuller #'s 1, 2. Located 100 cm below surface. Skull exhibited frontal cranial flattening. Copper stain present on right ulna. Collins : Good preservation, complete skeleton.

Burial #	Fuller #3
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. No analysis other than from previous research could be completed. Burial was flexed and lying on right side, but orientation is uncertain. Edmundson sketch in notes shows head pointing to west, Laughlin says southwest, and Collins says northwest. Interesting to note the abundance of grave goods, the trade items (i.e. copper artifacts) and the cranial deformation. Cranially deformed individuals at Fuller all have abundant artifacts and trade items buried with them.
Preservation and Inventory	Edmundson reports preservation was excellent.
Sex Determination	Laughlin indicates this was a female.
Age at Death	Edmundson, Laughlin, and Collins all state that individual was an "adolescent"
Stature	No stature determination was made.
Metric and Non-Metric Analysis	Laughlin did some cranial measurements and measured femoral length for this individual.
Dental Analysis	No dental analysis was completed.
Pathology/ Anomaly	Laughlin states the individual exhibited frontal cranial flattening.

Burial #	Fuller #4
OSMA #	11-154
Burial Type	Flexed
Side	Left
Orientation	Head to N (Laughlin) / SW (Collins)
Grave Type	unknown
Associations and Provenience	Shell (bivalves, and Dentalium) hung around neck and ankles, whalebone club along back with point toward pelvis. Located just north of fenceline and near first iron post west of cedar post (crude datum).
Sex Estimate	Laughlin : Male Collins : Indeterminate Stepp : Male (from cranial morphology)
Age Estimate	Laughlin : none (but field notes say adult) Collins : Adult Stepp : 44-50 years (from cranial suture closure)
Stature Estimate	1667 - 1681 mm (from Laughlin femoral length)
Notes/Observations from previous researchers	Edmundson : "The skull was all there, but broke in many pieces, all of which were saved. The body seemed to be that of an adult, sex undetermined." Also mentioned in finds of this day were "five skeletons, two restorable". Laughlin : Copper stain present on face but no copper objects found. Collins : May represent an individual of wealth and prestige.

Burial #	Fuller #4
OSMA#	11-154
Case Description (Stepp)	Remains are located at OSMA. There is some confusion with accession numbers labeled "11-154." The crania and mandible examined are definitely Fuller #4. There are however post-cranial remains (11-154A) that belong to a Klamath burial (see Cressman and Larsell 1945), plus 11-154 B, C, D, E post-cranial remains of at least four individuals of unknown origin. A label in the box of 11-154B says "Fuller #43" - but there were only 41 burials originally known from Fuller. Only the crania and mandible labeled Fuller #4 and 11-154 were examined here (plus a femoral length measured by Laughlin - see stature below). Burial is apparently flexed and lying on left side. Sketch in notes shows head to NE not in agreement with Laughlin or Collins. Location of other four skeletons noted as found are not sketched.
Preservation and Inventory	Both the crania and mandible are present. All bones were present except the palatine and left nasal. The sphenoid and right nasal were fragmentary. Other bones were mostly complete but had been reconstructed.
Sex Determination	Cranial morphology su ggests a male individual. The individual has large mastoids, a wide palate, a rugged nuchal area, heavy zygomatics, a medium to large brow ridge, and sloping forehead. Brow ridge and forehead are affected somewhat by intentional deformation.
Age at Death	Dental eruption indicates an age greater than 21 years. Dental attrition levels and tooth loss with bone resorption suggest even older. Cranial suture closure indicates an age between 44 and 50 years. Sagittal suture is completely fused. Cranial deformation may however have affected suture closure rate.
Stature	Femur not available for study, but Laughlin indicates a femoral length of 444 mm. This produces a stature range of 1667 - 1681 mm. Note - Laughlin's measurement is probably maximum length.
Metric and Non-Metric Analysis	All craniometric measurements were completed except palate length, which was not possible. Cranial measurements taken by Laughlin are consistent with current measurements. All non-metric assessments were completed except left post. condylar canal patent, accessory lesser palatine foramen present, palatine torus present, the ethmoid foramina, and sagittal bones present, which were indeterminate.
Dental Analysis	Most teeth are present, and all are fully erupted. Those missing postmortem include all four central incisors, the upper left and the lower right canines, and the upper right first molar. Missing antemortem are the upper left lateral incisor and the upper right third

Burial #	Fuller #4
OSMA #	11-154

molar - both sites showing bone resorption. Crowding is present at both lower third molar sites. The upper left first molar has occlusal caries and exhibits the most wear (score 65). Wear is greatest in the maxilla ranging from 30 in the third molars to 55 in the premolars and molars (with 65 in the upper left first molar). The mandible exhibits tooth wear ranging from 20 in the third molars to 50 in the first molars.

Pathology/ Anomaly

An exostosis is found in the right auditory meatus. Occlusal caries is noted in the upper left first molar.

Other

A green stain is found on the anterior portion of the maxilla and mandible. While no copper items were found with the burial, it is likely that at least one existed and had decomposed by the time of excavation.

This individual exhibits fronto-occipital cranial deformation. This fact was not mentioned by any of the previous researchers. Again, the association of significant grave goods, possible trade items (indicated by the green copper stain), and cranial deformation is noted.

Burial #	Fuller #5
OSMA #	11-155
Burial Type	Flexed (Laughlin) / Semi-flexed (Collins)
Side	Left (Laughlin) / Lying on back (Collins)
Orientation	North (Laughlin) / Head to SW (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	Bone beads possibly used as a nose plug. Located just north of second iron post west of cedar post (datum?). Burial was 4.5 feet deep and sunk into the clay stratum.
Sex Estimate	Laughlin : Female (in 1943 paper but Male? in notes) Collins : none Stepp: Male (crania and pelvis)
Age Estimate	Laughlin : adult (in field notes) Collins : none Stepp : 22-35 years (from cranial suture closure)
Stature Estimate	1631 - 1659 mm
Notes/Observations from previous researchers	Edmundson : Excavated on 6/14/41. Skull was collapsed and needed to be reconstructed.

Burial #	Fuller #5
OSMA#	11-155

Case Description (Stepp)

Remains are located at OSMA. Burial was either flexed or semi-flexed according to Laughlin and Collins. Edmundson has sketch in notes showing a burial with legs drawn up (flexed) but with arms stretched above head. There is also disagreement as to whether the burial was lying on its left side (Laughlin) or on its back (Collins). Both answers may be correct as the sketch shows the lower body on its left but with arms above head in such a manner that upper torso may have been twisted onto back. Orientation in the sketch is head to north (slightly NE) in agreement with Laughlin.

Preservation and Inventory

The skeleton was in fair condition. The parietal, temporal, maxilla, malar, frontal and occipital bones were all present (although had been reconstructed with glue and tape). The sphenoid was fragmentary, and the nasals and palatine were missing. The mandible body was present but broken on the right side just anterior to the ramus which was missing along with its condyle.

The second through fifth and seventh cervical vertebrae are present as are four thoracic and three lumbar vertebrae. The left innominate is present but missing the pubic portion. Both side humeri, radii, ulna, femora, patellae and fibulae are present as are the right clavicle and the manubrium. The tibiae are both present but have fragmentary distal portions. The right and left calcaneus and talus and the left fifth metatarsal are present. The right and left capitate, the left scaphoid and second through fifth metacarpals are present. Eleven phalanges are also present.

Sex Determination

Cranial morphology indicates a male individual. Mastoids are large, palate is wide, the individual has a large brow ridge, sloping forehead and rugged nuchal area. Pelvic morphology also indicates a male. The sciatic notch is narrow and pre-auricular groove is barely visible. Femoral head diameter (41.6 mm left, 42.2 mm right) indicates female by Pearson's rule, but this population produced more females by this method than expected (see discussion of this in text). Laughlin (1943) calls this individual a female but in the notes (Edmundson and Laughlin 1941-42) he lists it as a ?male.

Age at Death

Dental eruption and attrition suggest an individual greater than 21 years. Age estimation from cranial suture closure indicates an age range of 22-29 years. There was no suture closure endocranially or ectocranially.

Stature

Stature estimated in the range of 1631 - 1659 mm. Genoves gives lowest estimate at 1631mm. Trotter and Gleser formula give 1645 mm, and Neumann and Waldman equation 1655-1659 mm (right and left in-position lengths vary). Laughlin femoral length of 430 mm is 2 mm greater than my maximum length of 428 mm.

Burial #	Fuller #5
OSMA #	11-155
Metric and Non-Metric Analysis	All craniometrics were taken but those involving nasion and basion are estimated - these two landmarks are missing, but one can obtain good estimate. Palate length is not possible. Mandibular metrics are affected by loss of right ramus and condyle. Most cranial metrics were obtainable, see table in text. Laughlins list (in notes) of cranial metrics is in close agreement with current measurements (vary by 0-4 mm). Left innominate allowed for measurement of coxal height, cotylo-sciatic breadth, and ischial length, but iliac breadth could not be obtained. Sex estimate was obtainable, but missing pubis precluded age estimate from this source. All metrics from both side femora were possible.
Dental Analysis	Most teeth were present. Those missing postmortem include the upper right molars (bone missing), the upper left first molar, and the lower left central incisor. Teeth missing antemortem include all six lower molars. Bone resorption occurred at all lower molar sites. Occlusal caries occurs at the upper left second molar. Dental attrition levels vary from 30 (upper left third molar) to 60 (the upper right lateral incisor, canine and first premolar and the lower right first premolar).
Pathology/ Anomaly	Occlusal caries occurs in upper left second molar. Both humeri have a perforated coronoid fossa.

Burial #	Fuller #6
OSMA #	none
Burial Type	Flexed
Side	Left
Orientation	SW (Laughlin) / Facing W (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	Antler artifacts (Laughlin), Collins says no associations. Location uncertain but notes say they extended excavation six feet east, and that they were at the end of the mound. Depth of this individual was 4 feet and into the clay stratum.
Sex Estimate	Laughlin : Female Collins : Indeterminate Stepp : not available for study
Age Estimate	Laughlin : aged (from notes) Collins : none Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : "A badly decomposed skeleton was found, of an elderly individual, sex undetermined, at a depth of 4 feet. Two incisors only were present in the left half of the mandible. The rest of the alveolar process was entirely gone."

Burial #	Fuller # 6
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. Burial was flexed and lying on left side. Sketch in Edmundson's notes shows the head to the west, not in agreement with Laughlin or Collins. The notes say nothing of associations, while Laughlin suggests there was an antler artifact with the burial.
Preservation and Inventory	Edmundson indicates the skeleton was "badly decomposed." Present at least were two lower left incisors and the left half of the mandible.
Sex Determination	Laughlin claims the individual as Female. Edmundson left sex undetermined.
Age at Death	Laughlin and Edmundson both state the individual was elderly.
Stature	No stature estimate completed.
Metric and Non-Metric Analysis	No metric or non-metric analyses completed.
Dental Analysis	No dental analyses completed but bone resorption is suggested by Edmundson's statement that "the rest of the alveolar process was entirely gone". This could just mean the bone was missing or indicate bone resorption.
Pathology/ Anomaly	No pathology suggested or determined.

Burial #	Fuller #7
OSMA #	11-156
Burial Type	unknown
Side	unknown
Orientation	SE (Laughlin)
Grave Type	unknown
Associations and Provenience	No associations listed. Location indeterminate.
Sex Estimate	Laughlin : Female (from notes) Collins : no record Stepp : Female (from pelvis and femoral head)
Age Estimate	Laughlin : none (Edmundson says adult) Collins : no record Stepp : > 21 years (dentition and epiphyses)
Stature Estimate	1520 - 1564 mm
Notes/Observations from previous researchers	Edmundson : States in letter to Laughlin that he lacked notes on this individual, but that Laughlin and Wald had begun excavation on this burial and he had completed. Later (in notes dated 11/3/41) he mentions recovery of the bones, calling this an adult female. Collins : Lists "no record" for this individual.

Burial #	Fuller #7
OSMA#	11-156
Case Description (Stepp)	Remains are located at OSMA. Burial type and side are unknown, but Laughlin says the orientation was SE. Edmundson had no notes on this individual probably because Laughlin and Wald began the excavation and he only completed it. In an undated letter, Edmundson does ask Laughlin for "notes to complete my set" on this and other individuals.
Preservation and Inventory	Cranially, the left side of the mandible is present, as are small fragments of the occipital and parietals. Post-cranially, the second cervical vertebrae, one thoracic and five fragmentary lumbar vertebrae are present. The right innominate is represented by the ischial portion and fragmentary pubic and ilial portions. The left innominate contains w hole ischial, auricular and acetabular portions and fragmentary iliac blade. The right humerus is present and complete, the left has a complete distal end and fragmentary diaphysis. The left radius has a complete proximal end and fragmentary diaphysis. The right ulna is nearly complete with a fragmentary proximal end, while the left ulna is represented only by a complete proximal portion. The scapulae are represented only by a left glenoid portion. Both femora are nearly complete but have fragmentary distal ends. Both tibiae are complete. The right fibula is complete, the left nearly so with fragmentary distal end. The right and left talus and both calcanei are present. The right and left first metacarpal, the left second, both third, right fourth, and both fifth metacarpals are present. The left hamate, a fragmentary capitate and left trapezius are present. Two distal phalanges (one halux) and seven other phalanges are present. There is an extra left humerus (distal and diaphysis) labeled 11-156 but with note that says it does not belong to this individual (morphologically it obviously does not). There is also an extra left trapezium marked 11-156, but of different size than other carpals of this individual.
Sex Determination	Pelvic morphology suggests a female individual. Indicators include a wide sciatic notch and deep pre-auricular sulcus. Femoral head diameters are 38.6 mm (left) and 37.5 mm (right) indicating female. Laughlin also indicates a female individual (in the field notes).
Age at Death	Teeth are fully erupted and all epiphyses present are fused indicating an age in excess of at least 21 years. Edmundson notes say "adult."
Stature	Stature is estimated in range of 1520-1564 mm. Maximum morphological lengths were 395 mm (left) and 396 mm (right), giving the low end stature estimate of 1520-1523 mm (Genoves), while in-position length varied from 393 mm (left) to 382 mm (right) lending stature estimate of 1550-1564 mm (Neumann and Waldman). Laughlin lists femoral length of 396 mm, consistent with current maximum morphological length measurements.

Burial #	Fuller #7
OSMA #	11-156
Metric and Non-Metric Analysis	No cranial metrics were possible except those of the mandible, and here only on the left side including height and breadth of the ramus, gonial angle, and heights of the mandible. Non-metric analyses of the crania were also not possible. Post-cranially all measurements of both femora were obtainable, but only the left cotylo-sciatic breadth of the innominate measurements was possible. Both humeri contained perforated coronoid fossae. The additional humerus also had a perforated coronoid fossa.
Dental Analysis	Only the lower left mandible was present. The canine, both premolars and the first molar were present. The incisors were not present (bone is missing), and the second and third molars were missing antemortem. Two large abscesses exist at the second and third molar sites. There are two extra teeth (an upper canine and fragmentary molar) with the remains for this individual but are not clearly marked as belonging to it. The extra canine has a fused double root, and the molar has occlusal caries.
Pathology/ Anomaly	Large abscesses exist at lower left second and third molar sites - affecting height of mandible measurement at M2-M3. Extra molar has occlusal caries. Both humeri of this individual have perforated coronoid fossa. The extra humerus also exhibits this trait.

Burial #	Fuller #8
OSMA #	11-157
Burial Type	Flexed (Laughlin)
Side	unknown
Orientation	unknown
Grave Type	Pit, but disturbed (Collins)
Associations and Provenience	Shell beads (Dentalium), pestle, and copper pendant. (Notes list pestle as being "not far away", so should not be considered a grave item). Located two feet west and five feet south of "tallest cedar post" (probably the same as the datum post, referencing the other burials). This burial then, is just south of Fuller #'s 1, 2, 3. Found at depth of one foot, and also located one foot above bottom of mound stratum - although "mound...has been graded away for 2.5-3 feet" in this area.
Sex Estimate	Laughlin : Male Collins : none Stepp : Male (crania, pelvis, femoral head)
Age Estimate	Laughlin : none Collins : none Stepp : 35 (28-43 years, pubic symphysis)
Stature Estimate	1599 - 1639 mm
Notes/Observations from previous researchers	Edmundson : "Total volume of it (burial) was very small. Skull approximated pelvis, etc, so that area involved was about the length of the long bones. One would think of a sitting burial that had collapsed but that would hardly account for the head of a humerus and a rib being intruded through the top of the calvarium. Skull was in fragments all of which were collected save the mental process of the mandible." Excavated on 7/1/41. Collins : Disturbed pit, possible reburial. Fair preservation.

Burial #	Fuller #8
OSMA#	11-157

Case Description (Stepp)

Remains are located at OSMA. Laughlin says this was a flexed burial, but Edmundson's description sounds more like the burial had been disturbed such that burial type could not be determined. Side and orientation also could not be determined. Sketch in notes depicts a pile of bones. Sketch also shows the pestle located north of burial, and not definitely associated (Laughlin does not list it among associations).

Preservation and Inventory

Preservation is fair but many bones are missing. Cranially the parietals, temporals, nasals, maxilla and right malar are all present. The palatine, frontal, occipital, and sphenoid are fragmentary. The mandible body is fragmentary but both side ramus and condyles are present.

Post-cranially the first cervical, and one other cervical, four thoracic and five lumbar vertebrae are all present. Four segments of the sacrum are present, and the right auricular surface is present, the left fragmentary. The left innominate is complete, the right pubic bone, auricular surface and acetabulum are present while the ischium and iliac blade are fragmentary. The right humerus is missing the proximal end, the left has fragmentary ends but diaphysis is intact. The right and left radius are missing the proximal ends, and the left has a fragmentary diaphysis. The glenoid fossa and corocoid process of the right scapula are present. The right clavicle is complete. The left femur is complete, while the right is nearly so with a fragmentary proximal end. Both tibia are complete, except the right is missing its medial malleolus. Both fibula are represented by only fragmentary diaphyses. One hamate and three unidentified metacarpals or metatarsals, and two phalanges are present.

Sex Determination

A male individual is indicated by cranial morphology, pelvic morphology and by femoral head diameter. Cranial traits indicating male are medium to large mastoids, a heavy nuchal crest, large right zygomatic bone, a wide palate, large occipital condyles, and a prominent brow ridge. Pelvic traits include a narrow sciatic notch, no pre-auricular sulcus and robust morphology. Femoral head diameter of both sides is 45.5 mm.

Age at Death

Dental eruption and attrition level (30-70) suggest an individual greater than 21 years of age. Age from pubic morphology suggests an age of 35.8 years (score = 14, McKern and Stewart 1957) with a range of 28-43 years. Cranial suture closure suggests even greater age (range 44-49), with the sagittal, lambdoid and coronal all completely fused endocranially. The sagittal is completely obliterated and the lambdoid is fused near the sagittal ectocranially. Age estimate from pubic morphology is probably the most reliable indicator.

Stature

Stature estimates vary from 1599 mm (Genoves) to 1639 mm (Neumann and Waldman). Trotter and Gleser formula proposes estimate of 1616 mm. Only the right femur was used in estimate.

Burial #	Fuller #8
OSMA #	11-157
Metric and Non-Metric Analysis	All cranial measurements are possible except for bizygomatic and left orbital height - the left zygomatic arch is missing and the lower left orbit has been rebuilt. On the mandible the symphyseal height, diameter bigonial, diameter bicondylar, total length and the left height at PM1-PM2 are not possible. The maxillary palate length could not be measured. Many non-metric traits could not be assessed including those of the palatine (fragmentary), the basi-occipital (fragmentary), the ethmoid (fragmentary), and those associated with cranial sutures (due to extensive closure). Interestingly, there is an extra foramen along the sagittal suture, but it is not possible to deter mine which side of the suture it was on. There is also an extra foramen on the midline of the frontal bone. Post-cranially, all measurements were completed on the left innominate, but the right innominate is too fragmentary. Both femora were subjected to all measurements but the right maximum length and in-position length are estimated due to the fragmentary nature of the proximal end of this bone.
Dental Analysis	All maxillary teeth are present except the left third molar (bone missing). Mandibular teeth present include left and right second and third molars, right first molar, right first and right second premolars. The left first molar is missing postmortem, while the other mandibular teeth are missing (bone missing). Occlusal caries occurs in the lower left third molar. Dental attrition levels vary from 30-35 in the third molars and second premolars to 60-65 in the upper incisors and 70 in the upper first molars. Assignment of attrition levels was complicated by postmortem breakage and loss of the enamel of several teeth.
Pathology/ Anomaly	Occlusal caries occurs in the lower left third molar. Sutural closure is extensive. Extra foramina exist along the sagittal suture and in the midline of the frontal bone. A green stain exists on the interior surface of the frontal bone just above the left orbit. A copper pendant found with this individual, may have caused the stain.

Burial #	Fuller #9
OSMA #	11-161
Burial Type	Flexed
Side	Left
Orientation	SW (Laughlin) / Facing SW (Collins)
Grave Type	not reported
Associations and Provenience	not reported. Location was not reported.
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (crania)
Age Estimate	Laughlin : none Collins : none Stepp : 37-47 (suture closure)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Wrote a letter to Laughlin asking for notes on this burial to complete his set. States that this was the "badly decayed burial you exhumed the same day #11 was dug."

Burial #	Fuller #9
OSMA#	11-161
Case Description (Stepp)	Remains are located at OSMA. Burial was flexed and on left side. Orientation is either head to SW or facing SW. Grave type and associations were not reported.
Preservation and Inventory	The right parietal is present, while the left parietal, frontal, temporals and occipital are all fragmentary. No post-cranial remains are present.
Sex Determination	Fragmentary cranial morphology indicates a female. Indicative traits include a high forehead, rounded skull, small mastoids processes, and a small brow ridge (although most of it is missing). The individual does have however, a relatively rough nuchal area, and dull upper orbit edges, generally thought of as male traits. Laughlin assessed the individual as female, but criteria used are uncertain.
Age at Death	Cranial suture closure suggests an individual between 37 and 47 years of age. Fragmentary remains show that the coronal, sagittal and lambdoidal sutures were fused endocranially and ectocranially the sagittal and coronal sutures are thin lines nearly fused while the lambdoidal is beginning to close.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Maximum breadth was the only cranial measurement possible. Landmarks basion, prosthion and nasion are all missing, as is the right frontal bone and all of the facial bones. Many non-metric traits could not be scored due to the fragmentary nature of the crania. The only positive scores were those for presence of the highest nuchal line, a right side lambdoid ossicle, and exsutural mastoid foramina on both sides. The lambdoid ossicle is nearly at landmark asterion. No post-cranial analyses are possible.
Dental Analysis	No dental analyses are possible, all teeth, maxilla and mandible are missing.
Pathology/ Anomaly	No pathologies were noted.

Burial #	Fuller #10
OSMA #	11-162
Burial Type	Flexed
Side	Left
Orientation	Head to W (Laughlin) / Facing W (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	An incised antler digging stick handle was found lying behind the head. Shell beads, bird bone beads, one glass bead, a copper pendant, a decorated bone pendant, and copper stained feathers found around neck and ankles. (Shell species include Pelecopod, Dentalium, Littorina, Olivella). Fire hearth found near head and apparently associated with burial.
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (crania, pelvis)
Age Estimate	Laughlin : Adult (Edmundson says young adult in letter) Collins : Adult Stepp : 29.6 (20-38 years, pubic symphysis)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : This is another burial which Edmundson had few notes on. There is a letter asking Laughlin for notes that says this "young adult skull (was) found the same day as 9 and 11." Laughlin : This was only glass bead found with any of the Fuller burials. Earth composing the grave fill was of a finer texture than the surrounding earth. Skull was slightly deformed, frontally and occipitally. Skull was shown to Hrdlicka and Stewart who believed it to belong to the dolichocephalic or "Shoshonean" type prior to deformation. Collins : Mentioned fire hearth but does not say it is associated with burial.

Burial #	Fuller #10
OSMA#	11-162
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed and lying on left side. Orientation is either with head to the west or facing west. Fire hearth association is somewhat unique. Another letter from Edmundson mentions the Hrdlicka reference to Shoshonean types and suggests a link to the Molalla Indians, which Edmundson says came over the Cascade Mts. in early historic times (this is not necessarily an accurate notion).
Preservation and Inventory	Crania is complete. Nearly complete mandible is missing only the right coronoid process. Post-cranially all seven cervical vertebrae are present (the sixth and seventh are fused). Seven thoracic and three lumbar vertebrae are present. The sacrum is nearly complete, with the right auricular surface present but the left missing. Both innominates are present but the iliac blade and auricular surface of the left are fragmentary. Both side humeri, scapulae, clavicles, tibiae, and fibulae are present. The left radius and ulna and the sternal body and manubrium are present. The left and right first ribs are present as are large fragments of seven others. The right and left calcaneus, talus and cuneiform I are present. The left navicular and cuboid are present. The right and left first metatarsal and a fifth metatarsal are present. The right and left second, third and fourth metacarpals, and an unsided first metacarpal are present. There are several extra elements marked 11-162 including a left tibia (longer than the other two which obviously match), an extra right talus, and a fragment of first cervical vertebra.
Sex Determination	Both cranial and pelvic morphology indicate a female individual. Cranial traits suggesting female include small mastoid processes, no brow ridge, sharp upper edges of the orbits, small zygomatic bones and processes, and parietal bossing. Pelvic morphological traits suggesting female include a medium to wide sciatic notch, a very wide sub-pubic angle, an obvious pre-auricular sulcus, a triangular obturator foramen, and a wide pelvic opening. Laughlin also assessed the individual as female.
Age at Death	Dental eruption and attrition levels indicate an age greater than 21 years. Age determination from the pubis (Gilbert and McKern 1973) indicates an age of 29.6 (range 20 - 38 years, score = 6). Cranial suture closure suggests even greater age (40 - 47 years). The coronal and sagittal sutures are closed endocranially, the lambdoidal is nearly so. Ectocranially the coronal is disappearing at several sites, and the sagittal is just fusing near bregma. Age estimation from the pubis is considered the most reliable.
Stature	No stature estimate is possible (femora are missing).
Metric and Non-Metric Analysis	All measurements of the crania and mandible are possible. All cranial non-metric assessments are also possible except for presence of coronal ossicles (due to fusion of suture).

Burial #	Fuller #10
OSMA #	11-162
	Post-cranial measurements are not possible on the femora (missing), but are completed on the innominates except for iliac breadth of the left. The coronoid fossa of the humeri are perforated. Laughlin completed no metric analyses.
Dental Analysis	All maxillary teeth are present except for the left third molar, missing antemortem. All mandibular teeth are present except for the left first and second molars and the right first molar, all missing antemortem. Bone resorption occurs at all sites where antemortem tooth loss occurred. There are occlusal caries present in both upper right second and third molars. Attrition levels vary from a low of 30-35 in the second and third molars to a high of 50-55 in the lower incisors and the first molars. There is post-excavation breakage in the enamel of the upper central incisors.
Pathology/ Anomaly	Occlusal caries occurs in the upper right second and third molars. The sixth and seventh cervical vertebrae are fused across both the centrum and spinous processes. The origin of this arthropathic condition is undetermined. No extra bone growth is apparent. The coronoid fossa of both humeri are perforated. Ossicles occur at lambda and in the lambdoid suture. The crania has been subjected to artificial deformation. The occipital shows some flattening, while the frontal appears affected in a lesser manner.
Other	This burial also shows the association of abundant grave goods, trade items (glass bead and copper pendant) and a deformed skull.

Burial #	Fuller #11
OSMA #	11-163
Burial Type	unknown
Side	unknown
Orientation	N (Laughlin) / Head to N (Collins)
Grave Type	unknown
Associations and Provenience	A decorated camas digger. Location uncertain, but excavated same day as 9 and 10 (Edmundson).
Sex Estimate	Laughlin : Female (?Female in notes) Collins : none Stepp : indeterminate
Age Estimate	Laughlin : Adolescent (in field notes) Collins : none Stepp : 11-12 years (dental eruption)
Stature Estimate	not possible (femora missing)
Notes/Observations from previous researchers	Edmundson : Another burial which Edmundson has few notes, but asks Laughlin (in letter) for information. He does call this one a "young adult female flathead with the decorated camas digger." Laughlin : Field notes indicate occipital flattening.

Burial #	Fuller #11
OSMA#	11-163
Case Description (Stepp)	Remains located at OSMA. The burial type and side are unreported, but the orientation is listed as either north or head to north. Laughlin (1943) lists as a female, but in field notes he qualifies this as ?female.
Preservation and Inventory	The crania is mostly complete, but has been reconstructed. The nasals are missing, the sphenoid is very fragmentary, and the basi-occipital is missing. The maxilla and zygomatic bones are detached from the rest of the skull. The mandible is present and complete. No post-cranial remains are present.
Sex Determination	Sex is indeterminate, individual is too young to assess. Cranial morphological traits suggest a female. The individual has small mastoid processes, no brow ridge, a high forehead, sharp upper orbital edges, parietal bossing and a small to medium palate. But caution is warranted in this assessment due to the young age (11-12 years) of the individual. Laughlin also evaluated the individual as a ?female.
Age at Death	Dental eruption suggest an individual of approximately 11-12 years. None of the third molars are yet erupted. The upper second molars are not fully erupted, nor are the second premolars (upper and lower), or the upper left canine.
Stature	No stature estimate possible (no post-cranial remains).
Metric and Non-Metric Analysis	Some cranial measurements are possible. Many, however, are not reliable as maxilla and zygomatics had to be held in place while measurement was taken - i.e. measurements with nasion and prosthion are unreliable. Basion is also missing. Reconstruction of the skull may have affected measurements slightly. Deformation (asymmetric) has affected some measurements - there is a small chance this deformation is post-depositional. All mandibular and maxillary measurements were possible. Most non-metric assessments are possible. Laughlin took some cranial measurements including length and breadth, height of mandibular symphysis and bigonial. His results are in fair agreement with current (vary by 0-4 mm). No post-cranial measurements were possible.
Dental Analysis	Most maxillary teeth are present, but third molars are not erupted. Third molars have no room to erupt without crowding, although the individual is still young and may have grown. The upper right incisors and canine are missing postmortem. The mandible is missing all four incisors and the right canine (postmortem). All other teeth are present, but the third molars are not yet erupted - again little room without crowding.

Burial #	Fuller #11
OSMA #	11-163
	The upper left incisors are shovel shaped and exhibit an attrition level of 25. Maximum attrition level is 25 in the upper left incisors, the lower left canine, and all four first molars. All four first premolars are scored at attrition level 20. The rest of the teeth present are not fully erupted and exhibit attrition level 10 (no wear). It is noted that the upper left canine is not fully erupted but is already exhibiting slight wear (20).
Pathology/ Anomaly	The crania exhibits an asymmetric fronto-occipital deformation. The right half of the occipital bulges posteriorly much more than the left half. It is slightly possible that this is post-depositional deformation (but I lean toward artificial deformation). Laughlin notes this as "occipital flattening" in field notes, but does not mention flattening in 1943 article. Edmundson also notes this individual as a "flathead." Skull has been reconstructed but appears to fit together well.

Burial #	Fuller #12
OSMA #	11-158
Burial Type	Flexed
Side	Right (Laughlin) / Left (Collins)
Orientation	(NxW)W (Laughlin) / Facing W (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	Shell beads (Dentalium) Fuller #13 (11-159) pelvis found directly beneath this burial's pelvis. Location is "just west of the one associated with camas digger" (i.e. #11 or possibly #10). Also located just south of fenceline (2.5 feet, Edmundson sketch) and only one foot deep - although previously mentioned that area south of fence had been graded away 2-3 feet.
Sex Estimate	Laughlin : Female Collins : Indeterminate Stepp : Female (crania, pelvis, femoral head)
Age Estimate	Laughlin : Adult (field notes) Collins : Adult Stepp : > 21 years (epiphyseal closure)
Stature Estimate	1541 - 1572 mm
Notes/Observations from previous researchers	Edmundson : "This is the first case where two burials have been superimposed. 12 is very shallow, and a very small adult (tibia is 2-3" shorter than mine. No face or mandible are present, calvarium comminuted, and only one tooth found." Also mentions that "Skull is smallest yet, though adult. It is relatively round and quite thick. An exostasis (sic) presents are the inner table of left frontal, and another on outer table, higher up." (not sure what he means here). Laughlin : Soil texture above burials 12 and 13 differed noticeably from surrounding earth.

Burial #	Fuller #12
OSMA#	11-158
Case Description (Stepp)	Remains are located at OSMA. Burial was apparently flexed, but some confusion over side and orientation exist. Edmundson's sketch shows a flexed burial lying on left side with head to west. Edmundson notes a very short individual (based on tibia visual inspection), but estimation from femur (see below) shows an individual in line with other females from this population. Edmundson also notes that this skull had been reconstructed, but the one examined currently is very fragmentary.
Preservation and Inventory	The crania is represented only by both parietals, the frontal and left temporal, and a fragment of occipital (basilar portion is missing). No mandible or maxilla is present. The tooth mentioned by Edmundson is not present. Post-cranially three thoracic vertebra are present plus the first segment of the sacrum (right auricular surface is fragmentary, left missing). The right innominate consists of an ischium, ilial blade and auricular surface, and fragmentary acetabulum. The left innominate by fragmentary ischial and ilial portions. The right humerus radius and ulna are present. The left humerus is nearly complete but with fragmentary distal portion. Both clavicle have only the medial end. The left femur is present, the right only consists of proximal end and fragmentary diaphysis. The proximal right tibia is present. The proximal and diaphysial portion of the right fibula are present. The right calcaneus and navicular are present, the left calcaneus is fragmentary. One metacarpal and six phalanges are present. Fragments of a scapular blade are present.
Sex Determination	A female individual is indicated. Cranial traits suggesting female include a high forehead, parietal bossing, and small, narrow mastoid processes. Pelvic morphology contains a wide sciatic notch and a deep pre-auricular sulcus. Femoral head diameters are 40.2 mm (left) and 39.3 mm (right), indicating female.
Age at Death	Age at death is indicated only by closure of all post-cranial epiphyses, thus an age of greater than 21 years is estimated. No sutures are closing, indicating an individual in their 20's.
Stature	Stature is estimated between 1541 mm (Genoves) and 1572 mm. (Neumann and Waldman). Maximum length of femur is 403 mm (right) and in-position length is 400 mm. Laughlin measured femoral length at 406 mm (stature of 1549 mm by Genoves).
Metric and Non-Metric Analysis	Only maximum length, maximum breadth, minimum and maximum frontal breadths could be measured cranially. Very few non-metric traits could be assessed. Laughlin obtained cranial length and breadth and femoral length. Cranial length and femoral length were found to be 3 mm greater than current measurements.

Burial #	Fuller #12
OSMA #	11-158
	Post-cranially, both femora were measured but the left maximum length and in-position length were unobtainable. The right coxal height and right and left cotylo-sciatic breadth were obtained from the innominates.
Dental Analysis	No dental analyses could be completed.
Pathology/ Anomaly	No pathologies were noted. The "exostasis" (exostosis?) noted by Edmundson was not noticed in the current examination. One very small ossicle was noted in the sagittal suture.

Burial #	Fuller #13
OSMA #	11-159
Burial Type	Flexed
Side	Left
Orientation	Head to NW (Laughlin) / Facing NW (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	Beads of bone (nose plug?) and shell (Dentalium, Olivella, Acmae) decorating the legs. Fuller #12 (11-158) pelvis found directly above pelvis of this burial. Located "just west of the one associated with the camas digger" (i.e. #11 or possibly #10). Also located just south of fenceline (1.5 feet, Edmundson sketch) and 2.5 feet deep - although previously mentioned that area south of fence had been graded away 2-3 feet.
Sex Estimate	Laughlin : Female (?female in notes) Collins : Indeterminate Stepp : Female (crania, pelvis, femoral head)
Age Estimate	Laughlin : Adult Collins : Adult Stepp : 22-29 years (suture closure)
Stature Estimate	1520 -1559 mm
Notes/Observations from previous researchers	Edmundson : "This is the first case where two burials have been superimposed. Pelvis directly under that of 12. Mandible missing but face and calvarium present." Also, "skull is relatively long and thin." Laughlin : Soil texture above burials 12 and 13 differed noticeably from the surrounding earth.

Burial #	Fuller #13
OSMA#	11-159
Case Description (Stepp)	Remains are located at OSMA. Burial was flexed and on left side but orientation is uncertain. Edmundson sketch shows a flexed burial lying on left side with head to northwest, consistent with Laughlin. Edmundson also notes that this skull was reconstructed.
Preservation and Inventory	Cranial bones present (reconstructed) include both parietals, both temporals, both nasals, the maxilla, both malars, and the frontal. The occipital is missing its basilar portion, and the sphenoid is fragmentary. No mandible was found in excavation. Post-cranial remains include one thoracic vertebrae, the right radius and ulna, and the left femur, tibia and fibula present. The right femur is present but fragmentary at the distal end, the right tibia present but fragmentary at the proximal end, and the right fibula present but missing the proximal end. The right humerus is present but fragmentary at the proximal end. The sternal body is present. The right innominate has its pubic portion intact (but the symphyseal face is eroded), while the left innominate has its ischial portion intact and the ilial blade and acetabulum fragmentary. The right and left calcaneus are present (although the left is smaller than the right). The left talus and right navicular are also present. The left first metacarpal and three phalanges are present.
Sex Determination	Female sex is indicated for this individual. Cranial traits include a high forehead, small brow ridge, small mastoids (but fragmentary, so hard to assess), a small palate, parietal bossing, and smooth nuchal area. Pelvic morphological traits include a very wide sciatic notch and a deep pre-auricular sulcus. Femoral head diameters are 38.8 mm (left) and 39.6 mm (right), indicating female.
Age at Death	Dental eruption and attrition level (45-60) suggest an age greater than 21 years but this is far from definite as only the upper right first molar site is present (the actual tooth is missing postmortem). The right pubic symphyseal face is eroded but can be scored on component I at stage 1-3 (Gilbert and McKern 1973), with mean ages between 20-31 (this too is far from reliable). Finally, cranial suture closure is only slight at the endocranial sagittal suture, suggesting an age range of 22-29 years.
Stature	Stature is estimated between 1520 mm (left femur, Genoves) to 1559 mm (left femur, Neumann and Waldman). Femoral maximum lengths are 395 mm (left) and 400 mm (right) and in-position lengths are 389 mm (left) and 388 mm (right). Laughlin measures femoral length at 401 mm (side unknown).
Metric and Non-Metric Analysis	Cranial metrics are possible except for those involving the landmark basion (missing). Asymmetry of skull has affected some measurements (same measurement on opposite side varies greatly). Non-metric traits from the basilar portion of the skull are mostly not ass essed.

Burial #	Fuller #13
OSMA #	11-159
	Post-cranial metrics are complete for the femora. The innominates provided measurement of only the left cotylo-sciatic breadth and ischial length. Laughlin measured cranial length and breadth, bizygomatic, upper facial height (nasion-prosthion), nasal height and width, orbital measurements (appear to be orbital heights), and a femoral length. These measurements vary from the current by 0-3 mm.
Dental Analysis	No mandible is present. Maxillary teeth present include the incisors, canines, and premolars. The right first molar is missing postmortem, the other molar sites lost due to missing bone. Attrition levels vary from 45 (right canine) to 60 (left incisors). Attrition is 50-55 everywhere else.
Pathology/ Anomaly	This skull is asymmetric, with the face twisted to the left. This may be post-depositional deformation and also due in part to reconstruction.

Burial #	Fuller #14
OSMA #	11-160
Burial Type	Flexed
Side	Left
Orientation	Facing N (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	No artifacts found with this burial. Location is unknown but burial was 30 inches deep and at base of mound strata.
Sex Estimate	Laughlin : Male Collins : Male Stepp : Male (crania, pelvis)
Age Estimate	Laughlin : Aged Adult (field notes) Collins : Mature Stepp : 36-46+ (suture closure, and other)
Stature Estimate	not possible (femora fragmentary)
Notes/Observations from previous researchers	Edmundson : "Marked hypertrophicosteo - Thin skull arthritis and osteoporosis. Few teeth in male c most of cranial sutures closed. No artifacts. Teeth worn into roots."

Burial #	Fuller #14
OSMA#	11-160
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on left side and possibly facing north. Collins mentions the north orientation but there is no mention of it in the field notes. Likewise, there is no mention of a "pit" grave type for any burials in the field notes, but Collins consistently mentions this.
Preservation and Inventory	Cranial bones present include both parietals, both temporals, the maxilla, the frontal, occipital, and palatine. All of the mandible is present except for the left condyle. The sphenoid is fragmentary, the nasals and malars are missing. There are many small cranial fragments. Post-cranially many bones are represented, but are highly fragmentary. The first cervical vertebra and four other cervical vertebrae (not the second) are present. At least ten thoracic (but fragmentary) vertebra are represented. At least four lumbar vertebrae (but fragmentary) are represented. Two fragments of sacrum are found. The left and right innominates have fragments of the ischium and ilium (blade, acetabulum and auricular portions). The left humerus has proximal end present and fragmentary diaphysis and distal portions. The right humerus has distal end present but fragmentary proximal and diaphyseal portions. The left radius is present, the right has proximal and diaphyseal portions present but is missing the distal end. The right ulna is present but the left is fragmentary at both ends. Both scapula have only glenoid fossa present. The right clavicle has diaphysis present but is fragmentary at both ends. The xiphoid process of the sternum is present. Both femora have diaphyses but are fragmentary at proximal end and distal ends are missing. The right patella is present. The left tibia has distal end and fragmentary diaphysis. One diaphysis, side unknown, is from a fibula. There are 19 rib fragments (unknown number of ribs represented by this). The left talus, right navicular, and right first cuneiform are present. There are ten metacarpal and/or metatarsals represented and six phalanges. There are extra fragments of right scapula marked 11-160, but obviously not belonging to this individual.
Sex Determination	Male sex is indicated by both cranial and pelvic traits. Femoral head diameter, however suggests female. Male cranial traits include large mastoid processes, a medium sized brow ridge with large glabellar region, a sloping forehead, rugged nuchal area, a wide palate, and squared gonial angle. Pelvic traits suggestive of a male include a narrow sciatic notch and large, robust ilia. Femoral head diameters are 43.2 mm (left) and 42.9 mm (right) suggesting female by Pearson's rules, however, this rule gave more females than expected for this population and thus may not be applicable to the Fuller and Fanning materials. These measurements are at the top end of the head diameter size range for females.

Burial #	Fuller #14
OSMA #	11-160
Age at Death	Dental eruption sequence and attrition levels (up to 75-80, and tooth loss) suggest an individual well over 21 years of age. Cranial suture closure gives an age estimate of 36-46 years with many sutures closing. Endocranially, the sagittal, coronal and lambdoidal are all closed. Ectocranially, the sagittal and lambdoidal are fused along 50% of their length and the coronal is beginning to fuse. Older age is also indicated by extensive arthritic development over many parts of the skeleton (see below).
Stature	No stature estimate is made due to the very fragmentary nature of the femora.
Metric and Non-Metric Analysis	Metric analysis of the crania is affected by several missing portions. The nasals are missing and nasion only estimated. Prosthion is also missing. Orbital measurements and bizygomatic are also not possible. Many more non-metric trait assessments are possible - although few showed positive results. Laughlin performed cranial measurements including length and breadth, height of mandibular symphysis, bigonial, and right orbital height. His results agree within 0-1 mm with current measurements. Orbital height was not however, currently obtainable. Post-cranial measurements of the femora yielded all but maximum length and in-position length for both sides. Only the iliac breadth of the right innominate was obtainable.
Dental Analysis	Teeth present include both upper central incisors and the left lateral incisor, both upper canines, and both first premolars, the left lower second premolar, the left lower first molar and both lower second molars. Teeth missing antemortem include both upper second premolars and both upper first and second molars, both lower central incisors and the left lateral incisor, the lower right second premolar and lower right first molar. Bone resorption occurs at all sites of antemortem tooth loss. The lower canines and first premolars are missing postmortem. Occlusal caries occurs on the upper right first premolar and possibly on the lower left second premolar. All maxillary teeth present have an attrition level of 75. The lower second molars have attrition level 60-65, the lower first molar 70, and the lower second premolar 80. The lower third molars appear to be congenitally absent - there is little room for them. There are two extra unidentifiable root fragments loose from this individual. There are also an extra lower first molar, lower third molar and two canines marked 11-160 but in an envelope stating they do not belong to this individual - they obviously do not fit.
Pathology/ Anomaly	Occlusal caries occurs on the upper right first premolar and possibly on the lower left second premolar.

Burial #	Fuller#14
OSMA #	11-160
Pathology/ Anomaly cont.	Exostoses appear on the anterior wall of the auditory meatus on both sides. (These were not scored as auditory tori under non-metric traits). The vertebrae (cervical, thoracic and lumbar) all show extensive osteoarthritic lipping. It is especially pronounced in the lumbar. The proximal left humerus also shows arthritis, as does the glenoid fossa of the left scapula. A terminal phalange also show arthritis. Edmundson mentions in notes that this individual has "marked hypertrophicosteo - thin skull arthritis and osteoporosis."

Burial #	Fuller #15
OSMA #	11-165
Burial Type	Flexed
Side	Right
Orientation	Head to South (Collins)
Grave Type	Pit (Collins)
Associations and Provenience	An antler, camas digging handle found with individual. Collins says it was found in the "lap" of the individual. Location is unknown, but burial was intruded 12" below the base of mound and "in mound material" (i.e. surrounded with mound soils and not lower clay matrix?).
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (crania, pelvis, femoral head)
Age Estimate	Laughlin : Aged adult (field notes) Collins : Mature Stepp : 22-29 (cranial s uture closure)
Stature Estimate	no stature estimate possible
Notes/Observations from previous researchers	Edmundson : "Aged female, intruded 12" below base of mounds in mound material." Also, when discussing Fuller #15, "...and thin skull that looks like a long head..."

Burial #	Fuller #15
OSMA#	11-165
Case Description (Stepp)	Remains are located at OSMA. This burial was apparently flexed, lying on left side and oriented with its head to the south. Neither the notes or Laughlin (1943) mention a flexed burial, orientation, or a pit grave - not sure where Collins got his information.
Preservation and Inventory	Both parietals, both temporals are present, as are the frontal and occipital bones. The sphenoid, nasals and malars are fragmentary. The right side mandible body and ramus are present. Post-cranially, one lumbar vertebrae is present. Both innominates are fragmentary, the left acetabular region is complete. Both humeri are missing the proximal end, the right also has a fragmentary diaphysis. The right radius is missing its distal end and has a fragmentary diaphysis, the left is only a diaphysis. Both ulnae are missing the distal end and have fragmentary diaphyses. The left clavicle has a diaphysis, but is fragmentary at both ends. Both femora have a diaphysis, are missing the distal end and have fragmentary proximal ends. The right tibia has a distal end and fragmentary diaphysis, the left only a fragmentary diaphysis. A fragmentary diaphysis of fibula is included. The left calcaneus and talus and right cuboid, and a first metatarsal are present. The left fifth metacarpal is present and a fragment of another occurs. Two phalanges are also present.
Sex Determination	Pelvic and femoral indicators suggest the individual is a female. Cranial traits are less determinate. Cranial traits include a high forehead, and rounded, delicate skull. However, the skull also has dull upper orbital edges and large mastoids - possibly indicating male. The pelvis is fragmentary, but the individual does have a wide sciatic notch, indicating female. Femoral head diameters are 39.3 mm (left) and 39.0 mm (right) indicating a female individual. Laughlin and Edmundson also call this a female, although their determining criteria are unknown.
Age at Death	Dental eruption and attrition suggest an individual well past 21 years (all teeth erupted and lost with bone resorption, see below). All post-cranial epiphyses available for study are fused. No cranial suture closure has taken place however, indicating the individual is not too likely beyond 30 years of age. Estimated age range is 22-29 years (with an emphasis on the latter).
Stature	No stature estimate is possible from femora.
Metric and Non-Metric Analysis	Most cranial metrics are possible. Those involving prosthion are not obtainable (maxilla is missing). Analysis is also affected by reconstruction of the malars with clay. Only the right half of the mandible is present, but measurements requiring both halves are completed by taking right side measure to the midline and then doubling result (bigonial and bicondylar diameters). Non-metric traits are mostly obtainable, except for those involving the maxilla and lower face.

Burial #	Fuller #15
OSMA #	11-165

	Laughlin measured cranial length and breadth of the individual. His results varied by 0 mm and 1 mm, respectively from the current measurements. Femoral metrics are all possible except for the maximum lengths and in-position lengths (both sides). The only innominate measurement possible was the left co tylo-sciatic breadth.
Dental Analysis	No teeth are present. There are several sites along the right mandible available for study, however. Both incisors and the canine are missing antemortem, but no, or very little, bone resorption has occurred. The first premolar is missing, but it is difficult to assess whether the loss was post- or antemortem. The second premolar and all three molars are missing antemortem and bone resorption has occurred at all sites. There is a loose molar associated with these remains but it is impossible to tell if it belongs to this individual.
Pathology/ Anomaly	Artificial deformation does not appear to have occurred but there is an unusual asymmetric bulging of the posterior left side of the occipital bone. An Inca bone (ossicle at landmark lambda) exists, along with a second extra ossicle lying and partially outlining the Inca bone on its right and inferior borders. The lone lumbar vertebrae present exhibits osteoarthritic lipping.

Burial #	Fuller #16
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts with this individual. Location is "East 6', South 1', ... 16" deep." Other notes say "The hole extended from five to ten feet east of the post previously noted, and extended about six feet from the fence. All measurements will be from this post." It is uncertain whether this post is the original mentioned with Fuller #1 or a different post, but most likely it is at least along the same fence.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study.
Age Estimate	Laughlin : Infant (field notes) Collins : Infant Stepp : not available for study.
Stature Estimate	not available for study.
Notes/Observations from previous researchers	Edmundson : "an infant, broken up, no artifacts." Collins : "fractured and scattered"

Burial #	Fuller #16
OSMA#	none
Case Description (Stepp)	Location of remains is unknown, not at OSMA. Nothing is recorded of this burial's type, side, orientation or grave type. It is simply listed as an "infant, broken up, no artifacts." Collins states the remains are "fractured and scattered." The field notes say nothing of the remains being scattered, however.
Preservation and Inventory	It is possible nothing was collected, but this is not certain. The remains were at least poorly preserved, "broken up."
Sex Determination	No sex determination was completed.
Age at Death	Edmundson and Laughlin list the individual as an "infant."
Stature	No stature estimate was completed.
Metric and Non-Metric Analysis	No metric analyses or non-metric assessments were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #17
OSMA #	11-166
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts found with this individual. Location is "East 6', South 5', ...19" deep." Other notes state "the hole extended from five to ten feet east of the post previously noted, and extended south about six feet from the fence. All measurements will be from this post." It is uncertain whether this is same datum post referred to with Fuller #1 or a different post, but is likely along the same fence.
Sex Estimate	Laughlin : none Collins : none Stepp : none
Age Estimate	Laughlin : Infant (field notes) Collins : none Stepp : < 2 years (based on cranial fragments present)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : "an infant, skull all present but completely collapsed and broken into small pieces. No artifacts."

Table 19. cont.

Burial #	Fuller #17
OSMA#	11-166
Case Description (Stepp)	Remains are located at OSMA. Nothing is recorded of this burial's type, side, orientation or grave type. Edmundson states that all of crania is present but the few remains at OSMA do not make up an entire skull.
Preservation and Inventory	A fragment of the right mandible body and several small cranial flat bone and other fragments exist. The left pubic and right ischium are present as well as a fragment of right acetabulum. There is a navicular and four phalanges present, but these are too large to belong to the same individual. There origin is unknown.
Sex Determination	No sex determination was made.
Age at Death	Age at death is estimated at less than two years based on size of cranial fragments available.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	No metric or non-metric analyses were completed.
Dental Analysis	No dental analyses were completed. No teeth are present.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #18
OSMA #	11-167
Burial Type	Flexed
Side	Right
Orientation	Head to East (Collins)
Grave Type	possible pit?
Associations and Provenience	Copper stained feathers and shell beads (Dentalium) at right auditory meatus. Fiber of cedar (bark?) surround the skeleton. Fuller # 19 is located 1.5 feet SW, and Fuller #20 and #21 located directly beneath this burial. Location is "East 6', South 4 1/2, ... 31" deep." Also, "The hole extended from five to ten feet east of the post previously noted, and extended south about six feet from the fence. All measurements will be from this post."
Sex Estimate	Laughlin : none Collins : Indeterminate Stepp : none (too young)
Age Estimate	Laughlin : young adolescent Collins : Child Stepp : 9-12 years (dentition, epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : "...a child, calvarium mostly missing but face and base of skull present." Also, while excavating this burial Edmundson discovered ash and charcoal below it, thought this strange, then discovered #20 under the ash. Edmundson believed this burial to be later in time (a separate event) than #20 and #21 found below it. He believed #20 and #21 were buried together. The clay soils removed (from below) for interment of these earlier burials (#20, #21) did not extend up to the level of #18 and # 19, thus Edmundson concludes that they were buried earlier.

Burial #	Fuller #18
OSMA#	11-167
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on its right side with head to the east. Burial was in the mound soils - i.e. not into the clay soils below. It occurred directly above two other burials, and apparently occurred later in time, suggesting some extended use of the mound site. Later burial theory is consistent with presence of copper trade items. Fibers of cedar or cedar bark surrounded the burial. This practice is not mentioned in the literature for the Kalapuya, but is for other Oregon cultures including the southwestern Oregon Takelma and Athapaskans.
Preservation and Inventory	Preservation was poor. The right malar and right side of mandible is present. The left body of the mandible is fragmentary. The right parietal and temporal, the maxilla, frontal, and occipital are fragmentary. Few post-cranial remains are present. The sacrum is fragmentary, and twelve unidentified vertebrae fragments survive. There are two unsided fragments of pubic bone, the rest of the left innominate is present (epiphyses not fused), and the right ilium (all portions) is present (epiphyses unfused). A fragment of the diaphysis of the left radius is present. The right scapula is represented by the glenoid fossa and fragments of the spine and acromion. The right clavicle is missing the medial end, has a fragmentary lateral end and complete diaphysis. The right proximal femur is present, the left has proximal and diaphysis portions present. There is a right cuboid, left talus and right calcaneus present. Twelve metacarpals and/or metatarsals are present, as are twelve phalanges. There are also six unidentifiable fragments of long bone.
Sex Determination	No sex determination is possible for this younger individual.
Age at Death	Age at death is determined to be 9-12 years of age. Determination is made from an interesting sequence of eruption. The individual still has deciduous lower molars one and two on the left side (they are loose now, but fit in the mandible), both with an attrition level of 60 (judged by the scale for permanent teeth). The upper second molars were erupted (right side is missing), but the upper right second premolar was not fully erupted. The right lower first premolar was not fully erupted, the second premolar is missing, but the first and second right lower molars are both fully erupted. The lower left differs in that the first premolar is not fully erupted, the second premolar is not erupted and still has deciduous first molar over it, as well as deciduous second molar over the first permanent molar (which is missing, but must have been in there at death). Eruption of second molars occurs at about 12 years, eruption of the premolars between 10 and 12 years, but the remaining deciduous molars suggest an age as young as 9 years. It is possible the anomalous location of these deciduous teeth accounts for a delayed loss and this individual is closer to twelve years of age.

Burial #	Fuller #18
OSMA #	11-167
	Post-cranial epiphyseal union also suggests an individual at least younger than 13 years as none of the epiphyses available for study were fused.
Stature	No stature estimate is possible from fragmentary remains.
Metric and Non-Metric Analysis	All maxillary measurements were obtained except palate length. The mandible was measured, except for bigonial and bicondylar diameters and measurements of the left side. No cranial measurements could be made. Most non-metric traits were indeterminate. Some post-cranial measurements were possible, but the age of the individual (lack of epiphyseal union) creates some methodological problems. For the innominates, only iliac breadth was obtained. The left femur provided mid-shaft diameters and circumference and both femurs provided maximum head diameter.
Dental Analysis	The individual has an interesting dentition, especially with regards to eruption sequence. Maxillary teeth present include both central incisors, both canines, all premolars, and all molars, except the right second and third. Mandibular teeth present include the left deciduous molars, the central incisors, both canines, both first premolars, the left second premolar, and the right first and second molars. All lateral incisors are missing postmortem as are the upper right second and third molars, and the lower right second premolar and third molar and the lower left first molar. The lower left second and third molars are indeterminate. Both upper central incisors exhibit shoveling. The upper right second premolar and both the lowe r first premolars are not fully erupted. The present upper third molar was not erupted but can be seen in the mandible. The upper left second premolar and first molar were not erupted. The premolar can be seen in the jaw, the molar, while now missing, has a large space in which it would have fit. The two deciduous molars are interesting in that they usually rest over the first and second premolar sites, but in this individual they rest over the second premolar and first molar site. This may have some bearing on the apparent delayed loss of these teeth. The central incisors and upper firs molars exhibit attrition level 25. Other erupted teeth exhibit attrition levels of 10 or 20. The two deciduous molars exhibit attrition levels of 60 (although the attrition level scale may not be quite as applicable to non-permanent teeth).
Pathology/ Anomaly	See possible delayed loss of deciduous teeth described above. No other pathology or anomaly noted.

Burial #	Fuller #19
OSMA #	11-168
Burial Type	unknown
Side	Left
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts reported with this individual. Possibly associated with (i.e. buried with) Fuller #24. Location was 1.5 feet southwest of Fuller #18 which was 6 feet east and 4.5 feet south of a post. Possibly the same datum post mentioned with Fuller #1, or at least along the same fence. The pelvis of #19 was at the same level as #18 (31 inches).
Sex Estimate	Laughlin : Male Collins : none Stepp : Male? (crania, but femoral head disagrees)
Age Estimate	Laughlin : young adult (Field notes) Collins : Child Stepp : 15-20 (dentition and epiphyses)
Stature Estimate	1559 - 1577 mm
Notes/Observations from previous researchers	Edmundson : 11/27/41"Pelvis encountered at same level as 18 and 1 1/2' to southwest. Not excavated." Also mentions that individual is a "child." On 11/30/41 "Skull encountered at about 3 1/2, not excavated." And on 12/5/41 "Skull 6' east and 6' south of base post. Skull broken, probably can be restored. Female" Laughlin : Assesses individual as a "young adult" male.

Burial #	Fuller #19
OSMA#	11-168

Case Description (Stepp)

The remains are located at OSMA. The burial type, orientation, grave type and associated artifacts of this individual are unreported. Laughlin reports that it was lying on its left side. Edmundson noted the individual as a "child," while Laughlin says "young adult." Laughlin's assessment is more in line with age estimate (see below). There is some confusion over original estimation of sex, Laughlin assessing male and Edmundson female. There is a possible association with (i.e. burial with) Fuller #24. Interesting to note that the crania of #24 was found higher in the strata than expected (at 32 inches), and therefore at the same level as the pelvis of #19, while the crania of #19 was found at about 3.5 feet, the depth of the postcranial remains of #24. Possibilities include burial at the same time and thrown in grave in awkward positions, burial together with subsequent post-depositional disturbance, or #24 was buried first and then during burial of #19 the skull of #24 was disturbed. Association is likely but not positively demonstrated.

Preservation and Inventory

Cranially, both parietals, both temporals, and the mandible were present. The maxilla, frontal and occipital (basi-occipital missing) were fragmentary. The malar, palatine, nasals and sphenoid were missing.

Post-cranially bones were mostly fragmentary or missing. The first and second plus two other cervical vertebrae were present. Two upper thoracic vertebrae were present. The diaphyses of both humeri were present with fragmentary proximal ends and missing distal ends. The left ulna had fragmentary proximal and diaphyseal portions. The right scapula was present except for the corocoid process. The left glenoid fossa was present and the acromion was fragmentary. The left clavicle consisted of a lateral end, diaphysis and fragmentary medial end. The right femur consisted of fragmentary proximal end and diaphysis. The left femur consisted of proximal end and diaphysis, plus a fragmentary distal end. The right tibia had distal end and diaphysis with fragments of proximal end, while the left had fragments of all portions. The right fibula has distal end and diaphysis. The left and right tali, left navicular, left first cuneiform and one phalange are present. There is an extra diaphysis of tibia present marked "11-168 extra."

Sex Determination

The individual is a little young to be assigning sex but cranial traits do indicate male (they typically look female in young individuals). Cranial traits present indicating male include long mastoids, rough nuchal area, brow ridge present, dull upper edge of orbits, a large heavy mandible with a squarish gonial angle (118 o). Femoral head diameter is in the range for female? (42.6 mm), but head diameter estimates produced more females than expected. Laughlin estimated male for this individual, but Edmundson calls it a female in original notes. Criteria used by both are uncertain.

Burial #	Fuller #19
OSMA #	11-168
Age at Death	Dental eruption and attrition level indicates an individual between about 15 and 20 years. The second molars are all fully erupted with attrition level of 30. Third molars are not yet erupted. Some post-cranial epiphyses are beginning to fuse indicating an age between 16 and the early 20's.
Stature	Stature is estimated between 1559 mm (Genoves) and 1577 mm (Trotter and Gleser). Maximum length of femur was 396 mm (left side). In-position length was difficult to measure due to fragmentary nature of femur but estimated at 384 mm (stature by Neumann and Waldman from this is 1612 mm). Laughlin provides a length result of 396 mm, which gives a stature range of 1565 mm (Genoves) to 1584 mm (Trotter and Gleser).
Metric and Non-Metric Analysis	Many cranial measurements were not possible. Nasion is estimated (nasals missing), basion is missing as is the right half of the frontal bone and the right half of maxilla. Palate breadths and alveolar length were taken by measuring the left half and doubling the result. Mandibular measurements were all obtainable although the left gonion is estimated (missing) and the alveolus is rebuilt along the symphysis. Many non-metric traits were unobtainable, especially on the right side of the face and the basilar portion of the skull. Laughlin provided measurements of the cranial length and breadth, height of mandibular symphysis, bigonial diameter, and length of femur. His results varied from the current by 0-3 mm. Height of mandibular symphysis varied by 6 mm but the current measurement is compromised by breakage along the alveolus that may not have been present for Laughlin's measurement. Post-cranial measurement of the innominate was not possible. The left femur was completely measured although in-position length is a rough estimate. Lengths and head diameter of the right femur were not possible.
Dental Analysis	All maxillary teeth are present except for third molars (bone missing at right third molar site). The right first and second molar are loose due to missing bone. The left third molar is not visible (not erupted). All mandibular teeth are present except for the right first molar, missing antemortem. The lower right third molar is also not visible (not erupted), and there is little room for it along the jaw line. The lower left third molar is not yet erupted. All four upper incisors exhibit shoveling, and are all crowded. The lower right canine is erupted out of position between the central and lateral incisors. The canine does not appear fully erupted. The lateral incisor has an inordinate amount of wear (attrition level 70).

Burial #	Fuller #19
OSMA #	11-168
	The upper and lower left first molars show an unusual wear-use pattern (both at attrition level 55). The upper is very worn lingually and the lower very worn buccally. The right upper molar has attrition level 45, the lower is missing and bone resorption has occurred at the site. This tooth loss may account for the unusual wear of molars on the left side. All other fully erupted teeth exhibit attrition level 30, except for the four upper incisors and upper right canine (attrition level 25). The incisors are all crowded and the canine does not occlude with the anomalous (and out-of-position) lower canine.
Pathology/ Anomaly	See dentition discussion above.

Burial #	Fuller #20
OSMA #	11-171
Burial Type	Flexed
Side	Right
Orientation	Head to SW (Laughlin) / Head to SE (Collins)
Grave Type	possible pit
Associations and Provenience	Antler ear plugs (labrets) lay at either side of skull. Whalebone club lay along back with tip of blade near pelvis. Ash and charcoal found above the burial. Burial lay below #18 (which was above the ash and charcoal) and directly above #21. Possibly buried at same time as #21. Location is "East 6', South 4' at a depth of 41." Also, "The hole extended from five to ten feet east of the post previously noted, and extended south about six feet from the fence." cont. below.....
Sex Estimate	Laughlin : Male Collins : Male Stepp : Indeterminate
Age Estimate	Laughlin : Young Adult Collins : Adult Stepp : 18-20 years (dentition)
Stature Estimate	1536 - 1612 mm (if male) / 1497-1552 mm (if female)
Provenience cont...	All measurements w ill be from this post." This is possibly the same datum post mentioned with Fuller #1. It is at least along the same fenceline.
Notes/Observations from previous researchers	Edmundson : In discussing the skull "Skull is comminuted." and "Lateral-oblique pressure has produce distortion, such as one gets from standing on an apple crate." Also, "...think that their (#20 and #21) burial preceded that of the infant (#18, not really an infant) superficial to them." And "There is no question in my mind that these two burials occurred together." States that burials #20 and #21 were intruded into clay below mound soils, and that clay removed for burial appears as "chunks and lumps" a little above #20 but not up to the level of #18 or #19. Also, the burial depression is slightly larger than the skeleton - suggesting a pit burial. Burials were surrounded by mound soils intermixed with clay.

Burial #	Fuller #20
OSMA#	11-171

Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on right side, with head oriented to the southeast, in a pit grave. Laughlin says "head to SW" but Edmundson sketch in notes shows the head to the southeast. These interments (#20 and #21) possibly indicate an extended chronological use of the mound site, as they are located below an obviously separate burial event (possibly two events) - i.e. the burial of Fuller #'s 18 and 19.
Preservation and Inventory	Cranial elements present include both parietals, the palatine and maxilla and the left malar. Fragments of the frontal, the temporals, the occipital, and the sphenoid are present. The mandible consists of only a fragment of the left body and the right ramus. Post-cranial elements present include one cervical, two fragmentary thoracic, and five lumbar vertebrae. Fragments of the sacrum are also present. Both innominates are fragmentary, the auricular surfaces are intact, as is the left acetabulum and the right ilial blade. The right humerus is present, the left represented only by the diaphysis. The left radius is present but is missing the head. The right proximal ulna, and left distal and diaphysis portions are present, the left distal however is missing the epiphysis (unfused). The right glenoid and acromial portions of the scapula are present. The proximal and diaphyseal portions of the right femur are present, the left is present but has a fragmentary distal end. The right tibia has proximal end and fragmentary diaphysis and distal portions. The diaphyses of both fibulae are present. The left and right talus and calcaneus are present. One fragment of metacarpal or metatarsal is present.
Sex Determination	Sex of this individual is indeterminate, young age probably contributing to the difficulty in assessment. Cranial traits indicating sex include small mastoids and slight parietal bossing, indicating female, but also there is some nuchal ridge development and a heavy brow ridge, indicating male. The innominate does have a narrow sciatic notch, but the individual is young. Femoral head diameter is 40 mm (left) and 39.6 mm (right), indicating female, but again, the individual is young, and the femoral head has not shown to be a good indicator in this population. Both Edmundson and Laughlin assess the individual as a young male, but the criteria used are unknown. They may have based their assessment on the associated whalebone club, and Fuller #21, which is a male.
Age at Death	Dental eruption suggests an individual of 18-20 years. The upper third molars are not fully erupted and show no wear. The spheno-occipital synchondrosous is not fused indicating the individual is less than 21 years. The epiphysis of the distal ulna is not yet fused but is close. It typically fuses between 17 and 20 years.
Stature	Stature ranges for the individual were calculated for both male and female since sex is indeterminate. The male range is 1536 mm (Genoves) to 1612 mm (Neumann and Waldman), with a middle

Burial #	Fuller #20
OSMA #	11-171
	estimate of 1556 mm (Trotter and Gleser). The female range is 1497 mm (Genoves) to 1552 mm (Neumann and Waldman). Maximum length and in-position length of the left femur was 386 mm and 383 mm respectively. Laughl in provides a femur length of 389 mm which raises the Trotter and Gleser estimate by 6 mm and the Genoves estimates by 7 mm.
Metric and Non-Metric Analysis	Few cranial measurements were possible including length and breadth, nasal breadth and maximum frontal breadth. Basion is missing and prosthion and both porions are detached. All maxillary measurements were completed but only the right minimum breadth of ramus of the mandible could be completed. Many non-metric cranial traits were indeterminate. Those assessing positive included highest nuchal lines, ossicle at lambda (ossicle is missing but sutures present indicate it had to be there), and lambdoid ossicles were also present. Also, the mastoid foramina are exsutural, accessory lesser palatine foramina are present, and the left zygomatico facial foramen is present. Both femora were measurable but length measurements of the right were not obtainable. Both innominates were measured but coxal heights were not obtainable.
Dental Analysis	All maxillary teeth are present but the third molars are not fully erupted. Only the lower left third molar is present. All four upper incisors show shoveling. Attrition levels ranged from no wear on the third molars, 20 on all of the premolars, 25 on all incisors, 30 on the second molars and 45 on the first molars. The lone lower molar was at level 30.
Pathology/ Anomaly	No pathologies were noted. The left parietal bulges more than the right - this may be what Edmundson meant by a "lateral-oblique distortion" of the skull. It is apparently post-depositional in origin.

Burial #	Fuller #21
OSMA #	11-170
Burial Type	Flexed
Side	Right
Orientation	Head to SE (Collins)
Grave Type	possible pit
Associations and Provenience	Antler ear plugs (labrets) lay on either side of the skull. One variegated obsidian blade and one bone poniard extended from knees to shoulders. Behind the skull were the fractured jaws of a dog and an unidentified bird bill. Three cat species? claws around pelvis. Burial #20 lay directly above this individual. Burials #18 and #19 were located above #20. This individual was likely buried at same time (in same hole) as #20. provenience co ntinued below.....
Sex Estimate	Laughlin : Male Collins : Indeterminate Stepp : Male (crania, pelvis, femoral head)
Age Estimate	Laughlin : Adult Collins : Mature Stepp : 22-29 (pelvis and cranial suture closure)
Stature Estimate	1622 - 1656 mm
Provenience cont...	Location is "East 6', South 4' ..." Depth was directly beneath Fuller #20, which was at 41 inches. Laughlin notes say this burial was intruded up to 18 inches into the clay. Also, "The hole extended from five to ten feet east of the post previously noted, and extended south about six feet from the fence. All measurements will be from this post." This is possibly the same datum post mentioned with Fuller #1. It is at least along the same fenceline.
Notes/Observations from previous researchers	Edmundson : "I also think that their (#20 and #21) burial preceded that of the infant (#18, not really an infant) superficial to them." And "There is no question in my mind that these two burials occurred together." States that burials #20 and #21 were intruded into clay below mound soils, and that clay removed for burial appears as "chunks and lumps" a little above #20 but not up to the level of #18 or #19. Also, the burial depression is slightly larger than the skeleton - suggesting a pit burial. Burials were surrounded by mound soils intermixed with clay. Collins : Notes head deformation in this individual. (?)

Burial #	Fuller #21
OSMA#	11-170
Case Description (Stepp)	Remains are located at OSMA. This burial was flexed, lying on right side, with head oriented to the southeast, in a pit grave. Edmundson sketch in notes validates these attributes. These interments (#20 and #21) possibly indicate an extended chronological use of the mound site, as they are located below an obviously separate burial event (possibly two events) - i.e. the burial of Fuller #'s 18 and 19. Collins notes head deformation for this individual, but this is not the case - the source of his information is uncertain.
Preservation and Inventory	Crania is complete except for missing nasals and palatine, and fragmentary sphenoid. Mandible is complete. Much of the post-cranial skeleton is preserved. One cervical, six thoracic, five lumbar and two segments of the sacrum are present. Both auricular surfaces of the sacrum are preserved. The right innominate is complete (pubic symphysis a little eroded), but the left is very fragmentary, missing its pubis. The left humerus is complete, the right is nearly so with fragmentary proximal end. Both radii and ulnae are present. The right scapula consists of spine and acromion, the left of glenoid fossa and corocoid process. The right clavicle has a diaphysis and fragmentary ends, the left has lateral end, diaphysis and fragmentary medial end. The left first rib plus two other ribs are present. The xiphoid process is present. Both femora and tibiae are present as is the right patella and left fibula. The right and left talus, navicular and first metatarsals and the left calcaneus are present. Ten metacarpals and/or metatarsals are present as are 12 phalanges.
Sex Determination	The cranium, innominates and femoral head diameters all suggest a male individual. Cranial traits indicating a male include a heavy nuchal crest, dull upper orbital ridges, prominent brow ridge, large protruding occipital condyles, very long mastoid process, a heavy mandible and squarish gonial angles. Pelvic traits suggesting a male include a narrow sciatic notch, acute subpubic angle and a large acetabulum. Femoral head diameters are 44.4 mm (left) and 45.5 mm (right), the left falling in Pearson's unknown category, the right into the male? category. It is noted however that head diameters for this population seem to be smaller than Pearson's rules suggest for sex. Laughlin and Edmundson also assessed the individual as male.
Age at Death	Dental eruption suggest an individual over 21 years - the third molars are all erupted and show an attrition level of 30. The spheno-occipital synchondrosous is probably fused but it is difficult to judge from the fragmentary basilar skull. No cranial suture closure has occurred either endo- or ectocranially, suggesting an age in the 20's (22-29). Pubic age estimation technique (McKern and Stewart 1957) is somewhat compromised by a slight erosion of the symphyseal face but a total score of 6 provides an estimate of 22.4 years (20-24 years).

Burial #	Fuller #21
OSMA #	11-170
Stature	Stature is estimated in the range 1622 mm (Genoves), 1637 mm (Trotter and Gleser), to 1656 mm (Neumann and Waldman). Maximum morphological length and in-position lengths are 424 mm (left and right) and 421 mm (left), 422 mm (right) respectively. Laughlin also provides a femoral length of 424 mm.
Metric and Non-Metric Analysis	Cranial measurements are affected by several problems. Basion is inaccurate by as much as 5 mm, due to reconstruction of the basi-occipital. Nasion is estimated (nasals are missing). The zygomatic arches are missing and the maxilla cannot accurately be affixed to the rest of the cranium. Several measurements are, however, still possible. All mandibular measurements are possible. All maxillary measurements except for palate length are possible (palatine is missing). Many non-metric traits were not assessable due to fragmented nature of skull. All measurements of both femora were obtainable. All measurements of the right innominate were obtained but only the cotylo-sciatic breadth of the left was completed.
Dental Analysis	All maxillary teeth are present. All mandibular teeth except for the left central incisor (bone missing) are present. Occlusal caries exists at the upper left first molar and the lower right first molar. Attrition levels vary from 30 at the third molar and right lower premolar sites, 40-45 at the upper right premolar, lower right canine, and lower left second molar sites, 50-55 at the left premolars, left upper second molar, left canines, upper left lateral incisor, right lateral incisors, right upper canine, and right second molars, 60-65 at the lower left lateral incisor and all central incisors, to 70 at all first molar sites.
Pathology/ Anomaly	No pathologies are noted. There is a double Inca bone at the landmark lambda. It exists as two rounded bones divided at the midline. There is also a small ossicle located midway along the left lambdoidal suture.

Burial #	Fuller #22
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts found with this individual. Located 3.5 feet deep and 6 feet south, 1 foot east of post - presumably the same post as in burials 18-21, and the same as in Fuller #1 (maybe).
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : Infant Collins : Newborn Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : Simply listed as a "newborn, no artifacts" plus the locational information given ab ove. Collins : States that bones were highly disturbed.

Burial #	Fuller #22
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. No information regarding burial type, side, orientation or grave type is recorded for this individual. The skeletal remains are that of a newborn or infant. Collins states the remains were highly disturbed but the source of his information is unknown.
Preservation and Inventory	No remains are available for study. Collins suggest they were highly disturbed, possibly indicating preservation was poor.
Sex Determination	No sex determination is possible.
Age at Death	Age at death is limited to classification as an infant or newborn.
Stature	No stature estimation is possible.
Metric and Non-Metric Analysis	No metric analyses are possible.
Dental Analysis	No dental analyses are possible.
Pathology/ Anomaly	No pathologies were noted.

Burial #	Fuller #23
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations	No artifacts found with this individual. Located 3.5 feet deep and 6 feet east, 10 feet south of post - presumably the same post as in burials 18-21, and the same as in Fuller #1 (maybe).
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : Newborn infant Collins : Newborn Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : Simply listed as a "newborn, no artifacts" plus the locational information given above.

Table 19. cont.

Burial #	Fuller #23
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. No information regarding burial type, side, orientation or grave type is recorded for this individual. The skeletal remains are that of a newborn or infant.
Preservation and Inventory	No remains are available for study. Collins suggest they were highly disturbed, possibly indicating preservation was poor.
Sex Determination	No sex determination is possible.
Age at Death	Age at death is limited to classification as an infant or newborn.
Stature	No stature estimation is possible.
Metric and Non-Metric Analysis	No metric analyses are possible.
Dental Analysis	No dental analyses are possible.
Pathology/ Anomaly	No pathologies were noted.

Burial #	Fuller #24
OSMA #	11-172
Burial Type	Flexed
Side	Right
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts found with this individual. Possibly buried with Fuller #19 Located 54 inches east and 6 feet south at 3.5 feet deep. Presumably measured from the same datum post as burials 18-21, and possibly the same original datum referenced with Fuller #1.
Sex Estimate	Laughlin : none Collins : none Stepp : Male? (crania)
Age Estimate	Laughlin : none Collins : none Stepp : 29 years (22-35, pubic symphyseal face, cranial sutures)
Stature Estimate	1563 - 1630 mm
Notes/Observations from previous researchers	Edmundson : On 11/30/41 mentions that burial was "removed up to clavicles. No artifacts that far." But on 12/5/41 "Head not as deep as expected, merely 32". Skull broken but restorable, no artifacts. Mandible about gone, also maxilla. possibly buried c #19."

Burial #	Fuller #24
OSMA#	11-172
Case Description (Stepp)	Remains are located at OSMA. Burial was flexed, lying on right side, but of unknown orientation and grave type. No artifact associations were found but the individual was discovered just below Fuller #19 and Edmundson thought the two may have been buried together. Interesting to note that the crania of #24 was found higher in the strata than expected (at 32 inches), and therefore at the same level as the pelvis of #19, while the crania of #19 was found at about 3.5 feet, the depth of the postcranial remains of #24. Possibilities include burial at the same time and thrown in grave in awkward positions, burial together with subsequent post-depositional disturbance, or #24 was buried first and then during burial of #19 the skull of #24 was disturbed. Association is likely but not positively demonstrated.
Preservation and Inventory	Cranial remains present include the right parietal, both temporals, and the frontal bone. Fragments of the two occipital condyles are present. Both side ramus and condyles of the mandible are present but the body is missing. Postcranial remains present include the first plus two more cervical vertebrae, six thoracic and four lumbar vertebrae. The right innominate has fragments of ilial blade and auricular surface, while the left pubis and fragments of ilium blade, auricular surface and acetabulum occur. The right humerus exists as distal and diaphysis portions with fragmentary proximal end, while the left distal is present with fragmentary proximal end. Both radii are present. The left ulna has proximal end only, while the right has proximal and diaphysis portions present. Both scapula are present but missing the corocoid process. Both clavicles have medial end and diaphysis, the right is missing the lateral end while the left lateral end is fragmentary. Three rib fragments are present. Both femora are complete. A left and right patella are present, but are of different size (possibly one of them belong to a different individual, #19 is missing both patellae). The right tibia has distal portion only, the left has distal and diaphysis. The diaphyses of both fibula are present. The left and right talus and right calcaneus are present. Six metatarsals and/or metacarpals, and nine phalanges are present.
Sex Determination	Cranial traits indicate the individual was a male, including long mastoids, a medium to large brow ridge, and rugged nuchal area. These cranial attributes, in this case, seem inconclusive and so the individual will be judge as a male?. The sciatic notch appears to be narrow but the fragmentary nature of the innominates makes this difficult to judge. Femoral head diameters are 44.0 mm (left) and 43.5 mm (right), falling in the unknown category for sex estimation.
Age at Death	Estimation of age from the left pubic symphyseal face is possible and gives an estimate of 29 years (22-35, Mckern and Stewart score of 12). Cranial suture closure indicates and age range of 26-31 based on endocranial closure of the lambdoid. Other sutures are too fragmentary to read.

Burial #	Fuller #24
OSMA #	11-172
	Osteoarthritic lipping of the cervical, thoracic and lumbar vertebrae also suggest an older individual.
Stature	Stature estimates are 1563 mm and 1572 mm (right and left side Genoves), 1581 mm and 1590 mm (right and left side Trotter and Gleser), and 1626 mm and 1630 mm (right and left side Neumann and Waldman). Femoral maximum lengths are 402 mm (left) and 398 mm (right), while in-position lengths are 399 mm (left) and 396 mm (right). Laughlin provides a femoral length of 412 mm, widely different from the current measurement. This results in a stature estimate of 1595 (Genoves) to 1612 (Trotter and Gleser).
Metric and Non-Metric Analysis	Only cranial length and breadth and minimum breadth of ramus measurements were possible. All of nasion, basion and prosthion were missing, as well as many whole cranial bones. About half of the non-metric traits were un-assessable. Both femora were measured completely. No innominate measurements were possible. Laughlin also provided cranial length and breadth measurements which were 1 mm shorter than the current results. He also provided a femoral length of 412 mm, 10 mm (left) and 14 mm (right) different from the current results.
Dental Analysis	No dental analyses were possible, as no teeth or alveolar processes were collected.
Pathology/ Anomaly	Several small lambdoid ossicles are present on both sides. Osteoarthritic lipping occurs on all cervical, thoracic, and lumbar vertebrae present.

Burial #	Fuller #25
OSMA #	11-173
Burial Type	unknown
Side	Left (Laughlin)
Orientation	Head to N (Edmundson)
Grave Type	unknown
Associations and Provenience	A single shell pendant found under chin. Located 1 foot east and 10 feet south of post (same post as in Fuller #'s 18-21). Skull at about 2.5 feet deep.
Sex Estimate	Laughlin : Female Collins : none Stepp : Female (pelvis, femoral head)
Age Estimate	Laughlin : none Collins : none Stepp : 22-29 (suture closure)
Stature Estimate	1544 - 1575 mm
Notes/Observations from previous researchers	Edmundson : Few notes but on 11/30/41 "Not excavated. (later) spine points N-S on left side." And on 12/5/41 "Fuller #25 still not excavated." (Burial was apparently excavated at a later date).

Burial #	Fuller #25
OSMA#	11-173
Case Description (Stepp)	Remains are located at OSMA. Burial type was not reported but was lying on left side with at least the spine oriented north/south. Grave type is also unreported. Edmundson notes that this was not excavated on 11/30/41, and still not excavated by 12/5/41, but remains were apparently excavated at a later date.
Preservation and Inventory	Cranial remains present include both parietals, the left temporal, the maxilla and both malars. The occipital and frontal are fragmentary. The mandible consists of the body and both rami, but condyles are missing. Few post-cranial remains are present. The left ilium is fragmentary with acetabular region intact. The left humerus has distal and diaphysis portions, the right diaphysis is present, and there is a fragmentary unsided head of humerus. The distal portion of the right radius is present. The distal end and fragmentary diaphysis of right ulna are present, and the left has proximal and diaphysis portions present. Only the spine of the right scapula is present. The left femur is complete, the right has distal and diaphysis portions intact and a fragmentary proximal end. The right patella is present. The left tibia has a diaphysis and fragmentary proximal and distal ends, the right has a diaphysis and fragmentary distal portion. Both diaphyses of fibula are present and an unsided proximal fragment is present. The right and left talus and right and left calcaneus are present, as are unsided navicular and cuboid bones. Four metacarpals and/or metatarsals plus seven phalanges are present.
Sex Determination	The individual is assessed as female. Pelvic traits suggesting female include a wide sciatic notch and pre-auricular sulcus. Femoral head diameters are 41.3 mm (left) and 41.2 mm (right), and fall in the range for female sex estimation. Cranial traits are more ambiguous but include a small palate, and long slender mastoids, but also a brow ridge is present and the nuchal region is somewhat rugged with an occipital bun. Laughlin also assesses as female.
Age at Death	Dental eruption and attrition levels (up to 80, with tooth loss and bone resorption) suggest an individual well over 21 years. There is, however, no apparent cranial suture closure, which suggest an individual in their 20's (range 22-29 years).
Stature	Stature is estimated between 1544 mm (Genoves) and 1630 mm (Neumann and Waldman). Femoral maximum lengths were 405 mm (left and 404 mm (right), while in-position lengths were 402 mm (left) and 398 mm (right). Laughlin provides a femoral length of 406 mm, which would provide a stature estimate of 1549 mm (Genoves).
Metric and Non-Metric Analysis	The fragmentary nature of the skull mad most cranial metrics impossible. Basion is missing, prosthion is detached, as is the right porion, and nasion is estimated. Maximum length and breadth, minimum frontal breadth, and left porion-nasion were obtained.

Burial #	Fuller #25
OSMA #	11-173
	All mandibular measurements except bicondylar diameter, gonial angle and ramus height were obtained. All maxillary measurements were obtained except palate length. Most left side, cranial non-metric traits were assessed, but many right side traits were indeterminate. Both femora were completely measured. Only the left cotylo-sciatic breadth could be measured on the innominates. Laughlin provided measurement of the cranial length and breadth, height of mandibular symphysis, bigonial diameter and femoral length. His results varied by 0-3 mm from the current measurements.
Dental Analysis	All maxillary teeth are present although the left third molar is out of socket and the bone missing from this site. Mandibular teeth present include on the left side , the lateral incisor, canine, both premolars and the third molar and on the right side the lateral incisor, canine, and third molar. (The right lower lateral incisor has been glued into the mandible, crowded next to the canine. It does not appear to fit well in this socket and may not belong to this individual). Mandibular teeth missing antemortem include the left first and second molars and the right premolars and first and second molars. The mandibular central incisors are missing either antemortem or postmortem, the sites being filled with glue and therefore difficult to assess. Bone resorption occurs at all sites with antemortem tooth loss. Distal caries occurs on both upper second molars, and on the right side most of the distal portion of tooth is missing. Occlusal caries occurs on the lower right canine. All teeth present are heavily worn. Attrition levels vary from 30 in the upper right second molar (which has extensive distal caries), to 55 in the upper right first and third molars (which probably have less wear due to the painful caries in the second molar), to 60 in the upper left second molar and the lower left third molar, 65 in the upper left lateral incisor, 70-75 in the upper central incisors, the right lateral incisors, and canines, the upper right premolars, the lower right third molar, the left canines, the lower left premolars, and the upper left first and third molars, and 80 (i.e. roots functioning in occlusal surface) in the upper left premolars.
Pathology/ Anomaly	Distal caries in the upper second molars and occlusal caries in the lower right canine. Ossicles in the lambdoid suture.

Burial #	Fuller #26
OSMA #	11-175
Burial Type	unknown
Side	Left
Orientation	unknown
Grave Type	unknown
Associations and Provenience	An antler camas digging stick handle and two bivalve clams were found along the left humerus. Located 7 feet 3 inches south and 14 inches east of post. (Same post as referenced for Fuller #'s 18-21. Depth was 48 inches.
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (pelvis, femoral head, but crania disagrees)
Age Estimate	Laughlin : none Collins : none Stepp : 26-35 (cranial suture closure)
Stature Estimate	1526 -1590 mm
Notes/Observations from previous researchers	Edmundson : Reports on 11/30.41 that this individual was not excavated. Notes from 12/5/41 have location and associated artifact information - apparently the remains were excavated about this date.

Burial #	Fuller #26
OSMA#	11-175
Case Description (Stepp)	Remains are located at OSMA. Burial type, orientation and grave type were not recorded for this individual. Side was recorded as left.
Preservation and Inventory	Cranial remains present include both parietals, both temporals, the frontal and occipital bones. The sphenoid is fragmentary. The mandible is nearly complete but missing the condyles. Many post-cranial remains are present. Five cervical (including #'s 1-5), ten thoracic, four lumbar and two segments of sacral vertebrae are present. The right innominate is nearly complete, only missing the pubic bone, the left has ischium and fragmentary ilium. The right humerus is present the left has distal and diaphysis portions. Both radii are present the right being fragmentary at the distal end. Both ulnae are present, the right missing its distal end. Both scapula are present. Both clavicles are present. Both femora are present. The left patella is present. Both tibiae are present but fragmentary at the proximal end. Both fibulae are present. The left calcaneus and talus are present and fused together. The left navicular is present. The metatarsals and all but one metacarpal are present. Ten phalanges are present.
Sex Determination	Sex estimation from the pelvis and femoral head indicate female, while, cranial morphology suggests male. The deep and pitted pre-auricular sulcus and very wide sciatic notch of the pelvis (both sides), however, indicates the individual is most likely female. Femoral head diameters are 40.8 mm (left) and 40.9 mm (right) falling within the range for females. Cranial traits indicating male sex include a heavy brow ridge, large mastoids and rugged nuchal area.
Age at Death	Dental eruption and heavy tooth loss with extensive bone resorption suggest an individual well past 21 years. Arthritic fusion of the left calcaneus and talus also may indicate an older individual. However, cranial suture closure is not extensive only occurring endocranially along the coronal and sagittal sutures, providing an estimated age range of 26-35 years.
Stature	Stature estimates vary from 1526 mm (right) and 1588 mm (left) (Genoves), to 1587 mm (right) and 1590 mm (left) (Neumann and Waldman). Femoral maximum lengths were 421 mm (left) and 419 mm (right) and in-position lengths were 415 mm (left) and 412 mm (right). Laughlin provided a femoral length of 418 mm, lending a stature estimate of 1580 mm (Genoves).
Metric and Non-Metric Analysis	Cranial metrics are affected by a missing maxilla and prosthion and an estimated nasion. Measurements obtained include maximum length and breadth, basion-bregma, minimum frontal breadth, basion-porion, porion-nasion, basion-nasion, maximum frontal breadth, and foramen magnum length.

Burial #	Fuller #26
OSMA #	11-175
	All mandibular metrics were obtained except bicondylar diameter, gonial angles, and height of ascending ramus. No maxilla measurements could be taken (bone missing). Non-metric assessments were mostly possible except those involving the maxilla. Both femora were measured completely. The innominates provided all measurements except left coxal height. Laughlin measured cranial length and breadth, height of mandibular symphysis, bigonial diameter and femoral length. His results are within 0-1 mm of current results.
Dental Analysis	Only the right molar sites are available for study on the maxilla. All three teeth are missing antemortem with bone resorption. Mandibular sites available for study include all but the right premolar and molar sites. The left molars and right canine are missing antemortem with resultant bone resorption. The central and lateral incisors, left canine and left premolars are all missing postmortem. Wear patterns could not be addressed. Bone resorption of the mandible is extensive, even affecting the gonial angle which has become quite obtuse. Even though the angle cannot be measured (condyles are missing) it is at least 135°.
Pathology/ Anomaly	The left talus and calcaneus are fused, most likely from arthritic causes.

Burial #	Fuller #27
OSMA #	11-176
Burial Type	flexed
Side	Right
Orientation	Head to SW (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	No associations reported. Located 10 inches east and 10 feet south of post, at a depth of one foot. "All measurements from next to east post" - uncertain which post this is but along the same fenceline as others.
Sex Estimate	Laughlin : none Collins : Indeterminate Stepp : none
Age Estimate	Laughlin : Infant Collins : Child, age 4-6 years Stepp : 9-18 months (dentition)
Stature Estimate	No stature estimate possible
Notes/Observations from previous researchers	Edmundson : "A child 4-6 years old, an extreme flathead, which might serve to fix a minimum age for latest use of mound. When did Indians stop flattening heads?"

Burial #	Fuller #27
OSMA#	11-176
Case Description (Stepp)	Remains are located at OSMA. Grave type and associations are not recorded in notes but sketch shows it lying on right side, flexed and oriented with head to the southwest.
Preservation and Inventory	The only cranial remains preserved are the right side foramen magnum of the occipital bone and a few small unidentified fragments. Many more post-cranial remains are preserved. Epiphyses are all missing due to the young age of the individual. Fragments of twelve centra and ten other fragments of vertebrae are present. The right innominate contains the ilium with auricular surface and a fragment of pubis, the left innominate has ilium and auricular surface with a more complete pubis. The right humerus is complete, the left has distal portion only. Both radii and ulnae are present. The right scapula has all but the corocoid process. The right clavicle is present. The right and left first ribs are present along with many small fragments of other ribs. The right femur has distal and diaphysis portions while the left has distal end and fragmentary diaphysis. The right tibia consists of proximal end and a portion of diaphysis. The fibulae have only proximal ends with one unsided diaphyseal fragment. Four carpals and /or tarsal fragments and nine metacarpal and /or metatarsal fragments are present. Six phalanges are present.
Sex Determination	No sex determination is possible.
Age at Death	Age at death is determined to be between 9 and 18 months. The basis for this is the presence of two loose teeth (no alveolus was preserved) including a fully formed and erupting or fully erupted deciduous incisor (which are usually erupted between nine months and the end of the first year) and one deciduous molar cap (no roots have formed) which was probably not erupted. As the molars tend to erupt between 18 months and two years of age, this individual is estimated to be between 9 and 18 months old. Other indicators of age include the complete lack of epiphyseal ossification in the post-cranial skeleton. This at least indicates an individual under five years of age.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	No cranial metric analyses were possible, only three non-metric traits were assessed (on the basi-occipital) and these are possibly not reliable due to young age of the individual. Measures of the diameters and circumference at mid-shaft of both femora were performed. Only the iliac breadth of the left innominate was performed.
Dental Analysis	Teeth present include on deciduous incisor, fully formed. This tooth was most likely erupted and exhibited no wear (the child was probably still nursing, no wear is expected). A deciduous molar cap, with no root formation is also present. This tooth was most likely not erupted.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #28
OSMA #	11-177
Burial Type	Flexed
Side	Right
Orientation	Head to NNE
Grave Type	unknown
Associations and Provenience	Scraping tools found associated with burial. Located 80 inches south of east post and 24 inches deep. It is uncertain which post this is along fenceline. Possibly the same post referred to in Fuller #27.
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (crania, pelvis)
Age Estimate	Laughlin : Aged Collins : none Stepp : > 21 years (dentition)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : "Aged female - almost edentulous skull broken - filled with dirt Thumb nail scraper associated"

Burial #	Fuller #28
OSMA#	11-177

Case Description (Stepp)

Remains are located at OSMA. Edmundson's sketch in notes shows burial was flexed, lying on its right side and oriented with head to north of northeast. Grave type was not recorded in notes.

Preservation and Inventory

Cranial remains present include both parietals, the occipital, the left temporal, and the left malar. The left half of the frontal is present, the right side fragmentary. The right temporal, maxilla and sphenoid are fragmentary. The left half of the mandible body and the left condyle are present, the left ramus is fragmentary.

Post-cranial remains are mostly fragmentary. The second and fifth through seventh cervical vertebrae are present, as are two thoracic and one lumbar vertebrae. Both innominates exist as iliac blade and fragmentary acetabulum. Both humeri are present, the left having a fragmentary distal end. Both ulna have proximal ends and fragmentary diaphyses. The right radius consists of fragmentary diaphysis, the left of proximal end with fragmentary diaphysis. The left scapula has glenoid fossa and fragments of blade, the right has a fragmentary glenoid fossa and blade fragments. The right clavicle consists only of diaphysis, the left of lateral end. The manubrium and fragmentary body of the sternum are present. Both femora have diaphysis present but fragmentary distal and proximal portions. The right patella is present, the left fragmentary. Both tibia have proximal ends and fragmentary diaphyses. Both proximal fibulae are present. The left and right calcaneus are fragmentary, the right talus and left cuneiform I are present. Six metacarpals and /or metatarsals and seven phalanges are present. There is one very small phalange, apparently not belonging to this individual present.

Sex Determination

The individual is assessed as female. Cranial traits indicating female include small mastoid processes, no brow ridge, a high forehead. (The individual does however have dull upper orbital edges and a rugged nuchal area, typically male traits). Pelvic traits indicating female include a wide sciatic notch. Laughlin and Edmundson also assessed the individual as female.

Age at Death

Dental eruption and attrition levels (up to 70-80) suggest an individual well over 21 years. No cranial suture closure is apparent, however, suggesting the individual may not be beyond their 20's (22-29 years).

Stature

No stature estimate is possible (femora too fragmentary).

Metric and Non-Metric Analysis

Cranial metrics obtainable include maximum length and breadth, basion-bregma, basion-porion, porion-nasion, basion-nasion, and foramen magnum length. The maxilla and prosthion are detached from the rest of the crania, and nasion is estimated (nasals are missing). Mandibular metrics possible include symphyseal height and height of mandible at premolar and molar sites on the left side. All maxillary metrics were obtained except for superior alveolar length.

Burial #	Fuller #28
OSMA #	11-177
	Most non-metric traits were obtainable. Those of the right side of the face were mostly missed. No innominate metrics were possible. The femora were measured for mid-shaft diameters and circumference. Lengths and head diameters were not obtained. Laughlin provided measurement of cranial length and breadth. His results were one millimeter shorter than the current measurements.
Dental Analysis	Maxillary teeth present include only the left canine and first premolar. Maxillary teeth missing antemortem include the lateral incisors, left second premolar and left first molar, the right premolars and right first molar. The upper central incisors are missing postmortem as is the right canine. The upper second and third molars are missing due to missing bone at these sites. Mandibular teeth present include only the left third molar. The left premolars and first and second molars are missing antemortem. The lower incisors are all missing postmortem. The right canine, premolars and molars are all missing due to missing bone at these sites. Dental attrition levels are 70 at the lower left third molar, 75 at the upper left first premolar and 80 at the upper left canine.
Pathology/ Anomaly	No pathologies were noted. A small lambdoid ossicle and a small parietal notch bone are present. The individual has a palatine torus.

Burial #	Fuller #29
OSMA #	11-178
Burial Type	Flexed
Side	Left
Orientation	Head to NW (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	No artifacts associated with this individual. Location is 65 inches from post and 30 inches deep. Uncertain as to which post is referenced, but possibly the same one as in Fuller #27 and #28. At least along the same fenceline as all others.
Sex Estimate	Laughlin : none Collins : none Stepp : none (too young)
Age Estimate	Laughlin : Child Collins : Child Stepp : 5-12 years (epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : "Child, No artifacts"

Burial #	Fuller #29
OSMA#	11-178
Case Description (Stepp)	Remains are located at OSMA. This was a flexed burial, lying on its left side with head oriented to the northwest (information from Edmundson sketch). Grave type is not recorded in the notes.
Preservation and Inventory	Cranial remains include the right malar, and fragments of both parietals, the left temporal, and the occipital. Post-cranial remains are also very fragmentary. Five lumbar vertebrae and the first segment of sacrum (unfused epiphyses) are present. Both innominates have fragmentary ischium and ilium (blade and acetabulum). An unsided proximal end of humerus (epiphyseal fragment) and unsided diaphysis of humerus are present. An unsided fragment of scapula glenoid fossa is present. Both femora have fragmentary proximal ends and diaphyses. Both tibiae have fragmentary diaphyses. A fragment of fibula diaphysis is present. The left and right talus, calcaneus and navicular are present. A cuboid and cuneiform are also present. Nine metacarpals and /or metatarsals are present, as are sev en phalanges. Three of these phalanges may not belong to this individual, as they are a bit larger than the others.
Sex Determination	No sex determination is made for this young individual.
Age at Death	Age at death is determined from evidence of epiphyseal union. Post-cranial remains are fragmentary and not well-represented but there is one proximal humerus with ossified epiphyses that ages between 5-12 years (based on size). There are also fragments of small unfused epiphyseal centers of the anterior sacrum judged to be from an individual of less than the early teens.
Stature	No stature estimate was obtained.
Metric and Non-Metric Analysis	No cranial metrics were possible, and few non-metric traits could be assessed. No innominate measurements were obtainable. Only the left femur could be measured for mid-shaft diameters and circumference.
Dental Analysis	No dental analyses were possible. No teeth (and no alveolus) were present. There is a loose but unlabeled premolar with these remains.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #30
OSMA #	11-179
Burial Type	Flexed (Collins)
Side	unknown
Orientation	unknown
Grave Type	possible pit burial
Associations and Provenience	Awl-shaped artifacts found with Fuller #'s 30, 31. Possible association of the two burials, but more likely, #31 was intrusive into #30. Uncertain which burial the awls were associated with. Located 70 inches south and 45 inches west, 44 inches deep. From "east" post - but not sure where this post is along fenceline, other than east.
Sex Estimate	Laughlin : Male Collins : Male Stepp : Male (crania and femoral head)
Age Estimate	Laughlin : none Collins : Indeterminate Stepp : > 21 years (dentition and epiphyses))
Stature Estimate	1725 - 1766 mm
Notes/Observations from previous researchers	Edmundson : On 12/8/41, "Intruded one foot plus into clay surrounded by mound dirt. Skull scattered the length of skeleton. 1/2 of jaw below feet,..." and speaking of #31, "This burial was intimately mixed with #30, and might have been made at the same time. However, the scattering of the skull of 30 suggests that it was encountered and broken into when #31 was interred." On 12/13/41 he recounts description of burials #30 and 31, "#30 Male Large pelvis, large femurs tibia etc. Fragments of large skull from near head to near feet of small skeleton (i.e. #31) No vertebrae noted. Most other bones in poor condition." Further states that he grouped the small skull and bones and "called them #31." Also, the "awl-like artifacts were found near the center of the group." Also a previous letter date 11/27/41 mentions that Edmundson found #30 in Laughlin's garage. The letter of 12/8/41 notes that Laughlin and Wald had been "pot holing" and found #30. Apparently at least part of #30 had been excavated prior to finishing the removal of #30 and #31.

Burial #	Fuller #30
OSMA#	11-179

Case Description (Stepp)

Remains are located at OSMA. The notes on this burial are somewhat confusing and lack a lot of information. Burial type, side, orientation, and grave type are unknown, and although Collins lists the burial as flexed, this information does not appear in the notes. A pit burial seems likely as this one is described as being intruded into clay and surrounded by mound dirt.

The burial was apparently mixed with Fuller #31, but provenience listed for #31 is 52 inches south, 1 foot west and 39 inches deep, offsetting it by 18 inches north, 33 inches east, and 5 inches in depth from #30. The "point" locations provided are still close enough for the burials to overlap, however.

Edmundson notes relatively large sized bones (including pelvis) with #30 and smaller bones of #31. The pelvis labeled with #30 however is not as robust as the rest of the bones - there is an extra and large superior pubic ramus (labeled 11-179) that may in fact be the remains of #30 instead of the smaller elements also labeled 11-179.

Confusion of remains may have arisen not just from the mixture of two burials but from the fact that they were excavated on different dates and by different individuals (Laughlin and Wald, then Edmundson). Edmundson's feeling that the burials were not concurrent but that #31 had intruded upon and disturbed #30 seems plausible.

Preservation and Inventory

Cranial elements present include the left parietal, left temporal, right malar and fragments of the maxilla, occipital and sphenoid. The mandible is limited to the left side body with fragments of the right, and the left side condyle and fragmentary ramus.

Post-cranial remains are very fragmentary.The right innominate is nearly complete with fragmentary pubis, the left has complete ischium, ilial blade and auricular surface with fragmentary acetabulum and pubis. These pelvic remains, however are smaller and less robust than the rest of the post-cranial remains associated with this individual. There is an extra superior pubic ramus that may be the true pelvic remains of 11-179. The left proximal humerus is present. The left proximal and fragmentary diaphysis of radius is present. A single rib fragment is present. The manubrium and fragmentary body of sternum are present. The right femur consists of fragmentary proximal end and diaphysis, the left of proximal end and diaphysis with fragmentary distal end. The right tibia is nearly complete but has fragmentary distal end, the left has distal end and fragmentary proximal end. The distal right fibula and unsided diaphysis are present. The left calcaneus and two tarsal fragments are present. Three carpals are present. Eight metacarpals and /or metatarsals and seven phalanges are present.

Burial #	Fuller #30
OSMA #	11-179
Sex Determination	Sex is assessed as male from both cranial traits and femoral head diameter. Cranial traits indicating male include large mastoid processes, a rugged nuchal area with occipital bun, and a robust mandible with squarish gonial angle (110 o, left side). The femoral head diameter is 47.0 mm (left side), within the range for male sex estimate. Pelvic traits indicating female sex include a wide subpubic angle (wider than 90o) and presence of a pre-auricular sulcus. The sciatic notch, however, is medium to small, possibly indicating male. There is also some confusion over the pelvic remains of this individual. This less robust pelvis may not actually belong to 11-179. There is an extra, larger superior pubic ramus labeled 11-179 that may truly represent this individual., No sex estimate is possible from this extra element.
Age at Death	Dental eruption and attrition level (40-70) suggest an individual over 21 years. All epiphyses available for study are also fused. Cranial suture closure is difficult to judge as crania is mostly disarticulated and many sutures missing.
Stature	Stature is estimated between 1725 mm (Neumann and Waldman) and 1766 mm (Trotter and Gleser). Genoves' formula provides an estimate of 1757 mm. Maximum length of the femur (left) is measured at 484 mm, while in-position length is 483 mm. Laughlin provides a femoral length of 482 mm.
Metric and Non-Metric Analysis	No cranial metrics were possible. Mandibular measurements obtained included all but bigonial and bicondylar diameters, and right side measures of ramus height, breadth and gonial angle. No maxillary measurements were obtained. Few cranial non-metric traits could be assessed, but a large Inca bone is present. Both innominates were completely measured, but may not belong to 11-179. Both femora were measured but maximum length and in-position length of the right femur could not be measured.
Dental Analysis	Maxillary teeth present include the right central incisor, right canine, left canine, all premolars, and left second and third molars. The upper first molars are missing antemortem. The left central and both lateral incisors are missing postmortem. The right second and third molar sites and teeth are missing.

Burial #	Fuller #30
OSMA #	11-179
	All mandibular teeth are present except for the right incisors and canine. The right lateral incisor and canine sites and teeth are missing. The right central incisor is missing but it is difficult to distinguish whether ant- or postmortem. The upper, right central incisor may exhibit shoveling, but is too worn to be positively identified as such. Bone resorption occurs at both sites of antemortem tooth loss (the upper first molars). Occlusal caries occurs in both lower third molars. Attrition levels are as follows: Lower left canine, and first premolar and lower right first premolar 40; lower left lateral incisor and second premolar and lower right second premolar 45; lower left central incisor, lower third molars, and upper canines and left third molar 50; upper left first premolar 55; lower second and first molars and upper right first premolar 60; upper left second molar and right second premolar 65; and upper left second premolar 70.
Pathology/ Anomaly	Occlusal caries occurs in lower third molars. Large Inca bone (the largest of this population) is present. Small but protruding occipital bun also present.
Other	Pelvic remains labeled 11-179, may in fact belong to 11-180, judging by state of preservation between the two burials, and the less robust nature of this pelvis compared to the rest of the individual.

Burial #	Fuller #31
OSMA #	11-180
Burial Type	semi-flexed, (knees flexed, Edmundson)
Side	unknown
Orientation	unknown
Grave Type	Possible pit burial
Associations and Provenience	Awl-shaped artifacts found with Fuller #'s 30, 31. Possible association of the two burials, but more likely, #31 was intrusive into #30. Uncertain which burial the awls were associated with. Located 52 inches south and 12 inches west, 39 inches deep. From "east" post - but not sure where this post is along fenceline, other than east.
Sex Estimate	Laughlin : Male (Male? in notes) Collins : none Stepp : Female (crania, femoral head)
Age Estimate	Laughlin : none Collins : none Stepp : > 21 years (dentition and epiphyses)
Stature Estimate	1520-1570 mm (female)
Notes/Observations from previous researchers	Edmundson : 12/8/41 - "This burial was intimately mixed with #30, and might have been made at the same time. However, the scattering of the skull of 30 suggests that it was encountered and broken into when #31 was interred. The skull of 31 is close to the pot-hole you and Mark dug....This was an extended burial, except for knees." On 12/13/41 he recounts description of burials #30 and 31, "#31 A mesacephalic Male?...Consists of small skull, small arms, extended neck ribs...All vertebrae except two noted and collected. Fifth sacral is lacking the neural arch, making it a spina bifida....I have grouped the small skull and small bones, and called them #31." Also, the "awl-like artifacts were found near the center of the group." Also a previous letter date 11/27/41 mentions that Edmundson found #30 in Laughlin's garage. The letter of 12/8/41 notes that Laughlin and Wald had been "pot holing" and found #30. Apparently at least part of #30 had been excavated prior to finishing the removal of #30 and #31.

Burial #	Fuller #31
OSMA#	11-180

Case Description (Stepp)

Remains are located at OSMA. The notes on this burial are somewhat confusing and lack some information. Burial type is described as extended except for the knees. Side, orientation, and grave type are not recorded in the notes. A sketch of burial #'s 30-31 is not clear enough to determine burial attributes.

The burial was apparently mixed with Fuller #30, but provenience listed for #30 is 70 inches south, 45 inches west and 44 inches deep, offsetting it by 18 inches south, 33 inches west and 5 inches in depth from #31. The "point" locations provided are still close enough for the burials to overlap, however.

Edmundson notes relatively large sized bones (including pelvis) with #30 and smaller bones of #31. The pelvis labeled with #30 (11-179) however is not as robust as the rest of the bones. Judging by the comparative states of preservation of the two burials, this pelvis (nearly complete) may in fact belong to #31 (11-180).

Confusion of remains may have arisen not just from the mixture of two burials but from the fact that they were excavated on different dates and by different individuals (Laughlin and Wald, then Edmundson). Edmundson's feeling that the burials were not concurrent but that #31 had intruded upon and disturbed #30 seems plausible.

Preservation and Inventory

Cranial remains present include both parietals, both temporals,the maxilla, both malar, the frontal and occipital (with fragmentary basi-occipital). The sphenoid and palatine are fragmentary. The mandible is nearly complete with fragmentary right condyle.

The post-cranial skeleton is nearly whole. All vertebrae are present except for the third and sixth cervical and the coccyx. The auricular surfaces are missing from the sacrum. Both humeri, radii and ulnae are present. Both femora, tibiae, fibulae and patellae are present. Both clavicles are present. The left scapula is present, the right has glenoid fossa and corocoid process. The right and left calcaneus, talus and navicular bones are present. There are two metacarpals and /or metatarsals and three phalanges present.

The pelvic remains labeled 11-180 include only fragments of left ischium and ilium (blade, auricular surface and acetabulum fragmentary). The pelvic remains labeled 11-179, but possibly belonging to 11-180 include a nearly complete right innominate with only the pubis fragmentary,, and a nearly complete left innominate with fragmentary pubis and acetabulum.

Burial #	Fuller #31
OSMA #	11-180

Sex Determination

The individual is assessed as female. Cranial traits indicating female include long slender mastoid processes, a narrow palate, parietal bossing, no brow ridge, a high forehead, a medium to wide gonial angle (121-123°), and overall gracility. Femoral head diameters are 38.9 mm (left) and 38.0 mm (right), well within the range for females.

The innominate labeled 11-180 has a pre-auricular sulcus but a narrow sciatic notch. The innominate labeled 11-179 has a pre-auricular sulcus and a wide subpubic angle and may actually be the pelvis of Fuller #31. Sex estimate is not based on either of these innominates but relies on other characteristics.

Laughlin assess the individual as male (1943) and as male? in the field notes. Criteria used are not reported.

Age at Death

Dental eruption suggests an individual over 21 years. The third molars are not present, but appear to be congenitally absent. Tooth wear however is only at level 30 in the second molars (which erupt at age 12) indicating the individual is not too far into their twenties. The spheno-occipital synchondrosous has fused, as have all other epiphyses, indicating age greater than 21 years.

Stature

Stature estimate ranges from 1520 mm (Genoves) to 1561 mm (Neumann and Waldman) using the right femur and 1544 mm (Genoves) to 1570 mm (Neumann and Waldman) using the left. Femoral maximum lengths are 404 mm (left) and 395 mm (right), while in-position lengths are 398 mm (left) and 391 mm (right).

Stature estimates of 1556-1629 mm are obtained if the formulae for male individuals are utilized (Laughlin assessed the individual as male or male?)

Metric and Non-Metric Analysis

All cranial metrics were possible. The medial border of the orbits are missing but good estimates were obtained. Basion is loose but can be replaced and good results achieved. All mandibular measurements were possible, but the right gonial angle and height of ascending ramus were estimated due to fragmentary nature of right condyle. All me asurements of the maxilla were possible, but palate length was estimated because the landmark staphylion is missing.

All cranial non-metric traits were assessed except for presence of palatine torus, absence of posterior ethmoid foramen and anterior ethmoid foramen exsutural on the right side.

All femoral metrics were possible on both sides. Only the left ischial length was possible in measuring the innominates. However, all measurements were possible on the pelvis labeled 11-179, which may belong to this individual.

Burial #	Fuller #31
OSMA #	11-180

Dental Analysis

All maxillary are present, except for third molars which appear to be congenitally absent.

All mandibular teeth are present except for the right incisors which are missing postmortem and the third molars which appear to be congenitally absent.

The four upper incisors exhibit shoveling.

The lower right second premolar has distal caries which has destroyed the distal and mesial half of this tooth. The lower right first molar has mesial caries which has also destroyed the distal and mesial portion of this tooth.

Attrition levels vary from 30 in the second molars and lower second premolars, to 40-45 in the other premolars, the canines, the upper lateral incisors, and the right first molars, to 50 in the left first molars, the central incisors and the lower left lateral incisor. Attrition level in the two teeth with caries was difficult to assess.

Pathology/ Anomaly

Edmundson notes that the fifth sacral vertebrae is missing its neural arch, "making it a spina bifida."

Caries occurs in the lower right second premolar and first molar.

Burial #	Fuller #32
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No associations found with this burial. Located 94 inches east, 110 inches south, 28 inches deep. Reference point is uncertain but probably the same post as in #27-31, the "east" post.
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study
Age Estimate	Laughlin : Infant Collins : Infant Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : only notes are locational information and "Infant, no associations."

Burial #	Fuller #32
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. Little information was recorded for this burial (see above).
Preservation and Inventory	No information reported in notes.
Sex Determination	No sex determination from previous researchers.
Age at Death	Recorded as an "infant."
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric analyses or non-metric assessments were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #33
OSMA #	11-181
Burial Type	unknown
Side	Left
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No associations found with this individual. Located 106 inches south, 133 inches east, and 31 inches deep. Reference point is uncertain but likely the same post as for #'s 27-31, the "east" post.
Sex Estimate	Laughlin : Male Collins : Male Stepp : Male (crania, pelvis, femoral head)
Age Estimate	Laughlin : "young" male Collins : Adolescent Stepp : 18-20 years (dentition and epiphyses)
Stature Estimate	1602 - 1626 mm
Notes/Observations from previous researchers	Edmundson : "No artifacts, young male, skull partly missing,....may be measurable."

Burial #	Fuller #33
OSMA#	11-181

Case Description (Stepp)	Remains are located at OSMA. Little burial information recorded except lying on left side and a non-specific provenience. Edmundson reports the skull "may be measurable" but Laughlin records no measurements, although several of the metrics he routinely took were possible (see below).
Preservation and Inventory	Crania is highly fragmentary, but contains portions of both parietals, both temporals, the maxilla, frontal, occipital, and sphenoid. The left malar is present. The mandible is complete. Post-cranial remains are also fragmentary. The first and second cervical vertebrae plus two other cervical, two lumbar, and four sacral vertebrae are present. Sacral auricular surfaces are present but the right is fragmentary. The left innominate has a complete ilium, the right has complete ilium with fragmentary ischium and pubis. The left humerus has fragments of diaphysis only, the right has distal end and fragmentary diaphysis. The left radius is present, the right has distal end and diaphysis. The left ulna has fragmentary proximal end and diaphysis, the right has distal end, diaphysis and fragmentary proximal end. The left scapula has fragmentary spine present, the right has fragmentary glenoid fossa and spine present and whole acromion (but epiphysis unfused). There are three rib fragments present. The left femur has proximal end and fragmentary diaphysis, the right has proximal end, diaphysis and fragmentary distal end. The left tibia has diaphysis only, the right has fragmentary proximal end only. There is an unsided diaphysis of fibula. The right and left calcaneus are present but fragmentary. There are four carpals present. The are six metatarsals and /or metacarpals and ten phalanges present.
Sex Determination	Sex is determined to be male, from cranial and pelvic traits, and femoral head diameter. Cranial traits indicating male include large mastoid processes, a prominent brow ridge, a square gonial angle, and wide palate (although fragmentary). Pelvic traits indicating male include a narrow sciatic notch, and a narrow pelvic inlet. Femoral head diameters are 44.9 mm (left) lying in the male? range, and 44.1 mm (right) lying in the unknown sex range - although for this population it is believed males may have smaller diameters than Pearson's rules allow (the method used here).
Age at Death	Dental age appears to be between 18-21 years, as the upper third molars are nearly fully erupted and the lower third molars are just beginning to erupt. Epiphyseal union has occurred at the distal humerus (usually complete by age 19), but is not complete at the proximal femur, proximal and distal radius and ulna (usually complete by 19-20 except distal radius and ulna by 23 years), the iliac crest, and the centrum of the lumbar vertebrae, and acromial process of the scapula (usually complete by 23-25th year). The spheno-occipital synchondrosous is also not fused (usually fuses about 21st year).

Burial #	Fuller #33
OSMA #	11-181

Stature	Stature is estimated between 1602 mm (Genoves) and 1626 mm (Neumann and Waldman). Trotter and Gleser give an intermediate estimate of 1618 mm. Maximum morphological length (left) is 415 mm, while in-position length (left) is 396 mm.
Metric and Non-Metric Analysis	Only left side porion-nasion could be measured cranially. All mandibular measurements were possible. Maxillary measurements taken reliably include only the superior alveolar length, while palate breadths (internal and external) were roughly estimated. Palate length could not be obtained. Few non-metric traits were assessable. Both femora were measured, but the right side lengths could not be obtained, while the left side lengths were estimated (but with good accuracy). The right innominate produced all but cotylo-sciatic breadth measurement, while the left provided iliac breadth and cotylo-sciatic breadth. Unfused epiphyses affecting post-cranial measurement included the iliac crest and ischium. The proximal end of the femur was not completely fused, but was well under way.
Dental Analysis	Maxillary teeth present include both canines, the left premolars and all molars. All incisors and the right premolars are missing postmortem. Mandibular teeth present include the left premolars and all molars. All incisors, both canines and the right premolars are missing postmortem. The upper third molars are almost completely erupted, while the lower third molars are just beginning eruption. The third molars show no wear (level 10). The second molars, left premolars and left upper canine are worn at level 30-35. The upper right canine is at level 40. The first molars are at 50 (left) and 55 (right).
Pathology/ Anomaly	No pathologies or anomalies are noted.

Burial #	Fuller #34
OSMA #	11-182
Burial Type	unknown
Side	Left
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No artifacts found associated with this individual. Located 92 inches east, 82 inches south and 30 inches deep. Probably referenced from "east " post. This is same post referenced with #'s 30-33.
Sex Estimate	Laughlin : none (female? in notes) Collins : none Stepp : Female (crania)
Age Estimate	Laughlin : none (but says "aged" in notes) Collins : none Stepp : > 21 years (dentition, epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : "Female? Aged badly disintegrated skull scattered No artifacts"

Burial #	Fuller #34
OSMA#	11-182

Case Description (Stepp)	Remains are located at OSMA. The only burial information reported is non-specific locational information and that individual was lying on left side. No associations were noted. Remains were very poorly preserved.
Preservation and Inventory	Cranial remains present include the right parietal. Fragmentary remains include the left parietal, both temporals, the frontal, the occipital and sphenoid. The frontal is in two pieces both of different thicknesses - possibly a second individual, but both labeled 11-182? The mandible body is whole but missing the rami and condyles. Post-cranial remains are also fragmentary. The first cervical plus two other cervical vertebrae, and two thoracic vertebrae are present. The right humerus is represented by fragmentary distal and diaphysis portions, the left by diaphysis, and there is an unsided proximal fragment. The left radius has fragmentary distal end present. The right ulna has distal end plus fragmentary diaphysis, the left has fragmentary diaphysis. The right scapula has a complete glenoid fossa but fragmentary spine, acromion and corocoid process, the left is fragmentary glenoid fossa only. The right clavicle is diaphysis only the left is diaphysis and fragmentary lateral end. Both diaphyses of femur are fragmentary and there is an unsided distal fragment. The right patella is fragmentary. The right tibia is represent by fragmentary diaphysis, the left by fragmentary distal and diaphyseal portions. The right distal fibula and fragmentary diaphysis are present, the left has fragmentary diaphysis only. There are fragments of right and left talus. There is one metatarsal or metacarpal and five phalanges.
Sex Determination	Remains are very fragmentary but the individual is assessed as female from cranial traits noted include small mastoid processes, no brow ridge, and a very small mandible. Overall appearance of post-cranial remains is small and gracile. Edmundson and Laughlin (in notes) assess the individual as a probable female.
Age at Death	Age at death is determined to be somewhat greater than 21 years. Lower third molars have erupted (upper are missing) and suffered heavy attrition - the left is missing antemortem with slight bone resorption, and the right has attrition level 70. In addition all epiphyses available for study are fused.
Stature	No stature estimate was possible from fragmentary femora.
Metric and Non-Metric Analysis	No cranial metrics were possible. The mandible was measured for heights as the premolar and molar sites. Very few non-metric traits could be assessed. Post-cranial metrics were restricted to the femoral mid-shaft diameters and circumference.

Burial #	Fuller #34
OSMA #	11-182
Dental Analysis	The maxilla and teeth are all missing. Mandibular teeth present include only the right second and third molars. The right canine, premolars and first molar and the left first premolar are all missing postmortem. The incisors and left canine are all absent due to missing alveolus at these sites. The left molars and second premolar are missing antemortem with resultant bone resorption at these sites. Resorption is very slight at the second and third molar sites. Attrition level of the two teeth present is 70 (crowns worn away on at least one side, extensive secondary dentine).
Pathology/ Anomaly	No pathologies were noted. The coronoid fossa of the right humerus is perforated.
Other	The frontal bone is in two pieces. One piece (right side and midline, above orbits) is much thinner than the other piece and may belong to another individual.

Burial #	Fuller #35
OSMA #	11-183
Burial Type	Flexed (Edmundson sketch)
Side	Left
Orientation	Head to northeast (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	No artifacts found associated with this individual. Located 6 feet west and four feet south of fence post. Depth was 40 inches, and at bottom of mound. Which fence post was reference is uncertain.
Sex Estimate	Laughlin : none Collins : Indeterminate Stepp : Female (pelvis)
Age Estimate	Laughlin : "aged" (in notes) Collins : old individual Stepp : > 21 years (epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 1/18/42... "Skull entirely missing. Bones broke up badly. A small, aged individual. No artifacts."

Burial #	Fuller #35
OSMA#	11-183
Case Description (Stepp)	Remains are located at OSMA. Sketch in Edmundson's notes shows a flexed burial, on its left side, with head oriented to the northeast (although skull is missing). Locational information is present but non-specific.
Preservation and Inventory	No cranial remains are present. Post-cranial remains are very fragmentary. Two thoracic and two lumbar vertebrae are present. The left innominate has fragmentary pubis, ischium and ilium, the right has fragmentary ilium. The left humerus has distal and diaphysis portions with fragmentary proximal end, the right is fragmentary diaphysis only. The right radius is proximal end only. The left ulna has proximal end with fragmentary diaphysis. The left scapula has fragmentary glenoid fossa, spine, and acromion. There is a left femur diaphysis. The right tibia is represented only by diaphysis. There is an unsided diaphysis fragment of fibula. Two metatarsals and /or metacarpals and two phalanges are present.
Sex Determination	Sex determination is female, based on pelvic traits including wide sciatic notches, presence of the pre-auricular sulcus, and the generally small and gracile post-cranial remains.
Age at Death	Age at death is determined to be > 21 years based on fusion of all epiphyses available for study. The basis for Laughlin and Edmundson's determination of "aged" is unknown.
Stature	No stature estimate was possible.
Metric and Non-Metric Analysis	No cranial metrics or non-metrics were possible. Post-cranial measurement was restricted to mid-shaft diameters and circumference of the left femur.
Dental Analysis	No dental analysis was completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #36
OSMA #	11-184
Burial Type	Flexed (Edmundson sketch)
Side	Left
Orientation	Head to North (Edmundson sketch)
Grave Type	unknown
Associations and Provenience	Olivella beads were found near pelvis. Located nine feet east and ten feet south of post (presumably the same post as in #35). Depth was 40 inches. Exactly which post is referenced is uncertain.
Sex Estimate	Laughlin : Female Collins : Female Stepp : Female (crania, pelvis, femur)
Age Estimate	Laughlin : "aged" (in notes) Collins : aged individual Stepp : > 21 years (dentition, epiphyses)
Stature Estimate	none
Notes/Observations from previous researchers	Edmundson : Notes of 1/18/42... "Very small aged, almost edentulous female. One whole Olivella near pelvis. Marked changed in all joints and in roots of remaining teeth. Skull too fragmentary to reconstruct."

Burial #	Fuller #36
OSMA#	11-184
Case Description (Stepp)	Remains are located at OSMA. Sketch in Edmundson's notes show individual is flexed, lying on left side with head oriented to north. Non-specific locational information is provided.
Preservation and Inventory	Cranial remains present include only the frontal bone. Fragmentary cranial remains include both parietals and both temporals. The right side mandible is complete the left has only fragmentary body. Post-cranial remains are also quite fragmentary. Two lumbar vertebrae and fragments of sacrum are present. Fragments of right ischium, ilial blade and acetabulum are present, the left consists of fragmentary ilium (blade, acetabulum, auricular surface). The left humerus has proximal end, diaphysis and fragmentary distal end, the right has distal end and fragmentary diaphysis. The right radius is complete, the left has diaphysis with fragmentary ends. The right ulna is present, the left has proximal end, diaphysis and fragmentary distal end. The right scapula has fragmentary glenoid fossa, spine and acromion present. The right clavicle has medial end and diaphysis, the left has only the medial end present. There are two rib fragments. The right femur has proximal end and fragmentary diaphysis and distal portions, the left has proximal end and fragmentary diaphysis. The right tibia has fragmentary proximal and diaphysis portions, the left has only fragmentary diaphysis. The fibulae have only fragmentary diaphyses. The left and right tali are present. The left calcaneus is fragmentary. The left first cuneiform is present. Seven metacarpals and /or metatarsal and four phalanges are present. There is a complete extra right femur present that is larger than the other two, labeled 11-184, but obviously belonging to another individual.
Sex Determination	Sex is assessed as female. Determination is made based on pelvic traits, femoral head diameter. Cranial indicators are based on fragmentary remains but tend toward female. Pelvic traits include a wide sciatic notch and presence of a pre-auricular sulcus. Femoral head diameters are 37.4 mm (left) and 37.3 mm (right) well within the range for females. Cranial traits indicating female include small mastoid processes, no heavy brow ridge, and gracile form (frontal bone only) - the crania is, however, very fragmentary and used with caution.
Age at Death	Dental eruption and attrition (extensive tooth loss, antemortem) suggest an individual greater than 21 years. All post-cranial epiphyses are fused, also suggesting an age at least greater than 21 years. Substantial osteoarthritic lipping in the lumbar vertebrae suggest advanced age.
Stature	No stature estimate was possible from fragmentary femora.

Burial #	Fuller #36
OSMA #	11-184
Metric and Non-Metric Analysis	No cranial metrics were possible. Mandibular measurements include symphyseal height, total length, and all measurements from the right side. Bigonial and bicondylar diameters are obtained by measuring the right half and doubling the result. Very few non-metric traits could be assessed. Post-cranial measurement was limited to mid-shaft diameters, circumference and head diameters of the femora. The extra right femur provided all measurements.
Dental Analysis	The maxilla was missing but the left second and third molars were present. The second molar showed occlusal caries. Wear patterns were not easily determined. The second molar has one edge heavily worn, while the other is not, and is scored at 35. The third molar has a partially obliterated cusp pattern but very little dentine is showing, scored at 25. No mandibular teeth are present. The left molar sites are all missing. The canines are missing postmortem. Other teeth are missing antemortem with resultant bone resorption at all sites.
Pathology/ Anomaly	Occlusal caries occurs in upper left second molar. Osteoarthritic lipping is substantial in the two lumbar vertebrae present. Edmundson notes a "marked change in all joints and in the roots of remaining teeth"

Burial #	Fuller #37
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	possible pit
Associations and Provenience	No associations reported with burial. Located four feet west, ten feet south and 40 inches deep, from a post. Which post is referenced is uncertain. May still be in trench along the previously mentioned "south fence," or at the end of another trench, the "central trench" (which may still be along the south fence).
Sex Estimate	Laughlin : none Collins : none Stepp : not available for study.
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : In notes of 2/16/42 discusses the burial found at the end of the center trench. Also on undated page of notes discussing #37 "So fragmentary it was not even saved." Also mentions it is 40 inches deep in sub mound clay.

Burial #	Fuller #37
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. Remains presumably left at Fuller site, uncollected by excavators. This burial was found at the end of a "center trench" apparently excavated after a "north trench." Burial was intrusive into the sub-mound clay, suggesting a possible pit burial.
Preservation and Inventory	Remains apparently were so fragmentary the excavators could not collect, or decided were of no value and did not collect.
Sex Determination	No sex determination was made.
Age at Death	No age determination was made.
Stature	No stature estimate was made.
Metric and Non-Metric Analysis	No metric or non-metric analyses were completed.
Dental Analysis	No dental analyses were completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #38
OSMA #	none
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	Possible association with Olivella beads. Located along "north fence of lane." Found one foot from fence and 35 inches deep. Near Fuller #39.
Sex Estimate	Laughlin : none Collins : Female Stepp : not available for study
Age Estimate	Laughlin : none Collins : none Stepp : not available for study
Stature Estimate	not available for study
Notes/Observations from previous researchers	Edmundson : "Very fragmentary, almost edentulous, probably female. Olivella beads possibly associated."

Table 19. cont.

Burial #	Fuller #38
OSMA#	none
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. Collins lists as female individual, but Edmundson's notes say "probably female." No analysis by Laughlin appears to have taken place.
Preservation and Inventory	Reported in notes as "very fragmentary."
Sex Determination	Edmundson reports as "probably female."
Age at Death	Edmundson reports individual to be "almost edentulous" possibly indicating an older individual.
Stature	No stature estimate was completed.
Metric and Non-Metric Analysis	No metric or non-metric analyses were completed.
Dental Analysis	No dental analyses were completed
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #39
OSMA #	11-185
Burial Type	Partially flexed (but see below)
Side	Right side (but see below)
Orientation	Head to SW (Edmundson sketch)
Grave Type	possible pit burial
Associations and Provenience	An antler camas digging handle lay near head. Olivella beads and copper items were found about the neck. Feathers preserved with a string of rolled copper tubes and Olivella beads were about the right shoulder. Fragments of cedar bark were present about the pelvis. Located 26 inches east and 34 inches north of a post. Depth was 38 inches. This post is the next one west from the reference post for #38 and along the "north fence of lane."
Sex Estimate	Laughlin : Female Collins : none Stepp : Female? (pelvis, femoral head, crania)
Age Estimate	Laughlin : Adult Collins : none Stepp : approximately 21 years (dentition, epiphyses)
Stature Estimate	1607 mm -1619 mm
Notes/Observations from previous researchers	Edmundson : Notes of 2/26/42... "This burial was at the edge of the hole.....The dirt was very loose and dark, with little clay. The burial itself was intruded in to the clay 4-6 (inches). It was on its face with right arm flexed, and left arm extended. Long leg bones were under spine and pelvis." "The bones themselves were in good state of preservation, so that one scapula was removed intact and even the skull was removed unbroken except where pressure had enlarged the foramen magnum and put the scraps along with a finger and several Olivellas inside the skull. There are no supraorbital ridges, There is marked fronte-occipital flattening Sex is female. Note the many similarities with #10 which was quite close by. Age-40- Teeth worn, and several missing from mandible." Laughlin : Thinks burial had been disturbed by shifting of mound earth. This is why it was laying on face.

Burial #	Fuller #39
OSMA#	11-185

Case Description (Stepp)	Remains are located at OSMA. Burial was partially flexed, lying on right side and oriented with head to the southwest. Laughlin believes the burial had been disturbed by shifting soils and this is the reason it was found lying on its face. Why the left arm was extended is unexplained. The burial is a possible pit burial suggested by the intrusion into the clay layer, but surrounded by mound matrix. Once again we have an association of abundant grave items, including trade goods, with a cranially deformed individual. Fuller #10 (and thus #9 and 11?) was apparently buried close by. Provenience given is non-specific (reference post is uncertain) but is along a "north fence of lane." Provenience of #10 was not recorded.
Preservation and Inventory	Cranial remains present include both parietals, both temporals, both nasals, the maxilla, both malar, and the frontal. The palatine, sphenoid, and occipital (missing one condyle and most of basi-occipital) are fragmentary. The mandible is complete. Post-cranial remains are also very well-preserved. All seven cervical vertebrae, all but the first thoracic, two lumbar vertebrae, and the sacrum are present. The sacrum has a fragmentary left auricular surface. The right innominate is complete, the left is nearly so but has fragmentary pubis and iliac blade. The right humerus is complete the left is nearly so but has fragmentary proximal end. Both radii, ulnae, scapulae, clavicles, patellae, tibiae and fibulae are present. The left femur is present. The sternum has manubrium and fragmentary body. The right and left first ribs, plus eleven nearly whole ribs and many small fragments are present. The right and left calcaneus, tali, navicular, cuboids, first and third cuneiform, and first through fifth metatarsals are present. The left second cuneiform is present. The right and left scaphoid and hamate are present. One capitate, trapezium and lunate are present. The left first, left third, right and left fourth, left fifth, and one unknown metacarpal are present. Twenty-two phalanges are present. There is an extra fragment of right scapula labeled 11-185 present - but obviously belonging to another individual.
Sex Determination	Sex is determined to be a probable female (female?). Pelvic traits indicating female include a wide sciatic notch, pre-auricular sulcus, and rounded pelvic opening (both innominates and sacrum are present). Femoral head diameter is 43.3 mm (left), in the range for a probable female estimate. Cranial traits are somewhat ambiguous and sex is indeterminate. Cranial sex indicators include a sloping forehead (male), no brow ridge (female), rugged but small malars (?), and a large left mastoid but small right mastoid process (see dental analysis below). Overall, the individual is very muscular.
Age at Death	Age at death is determined to be approximately 20-21 years. Upper third molars are fully erupted and beginning to wear. Lower third molars are not erupted, but may be missing congenitally. All post-cranial epiphyses are fused. The spheno-occipital synchondrosous,

Burial #	Fuller #39
OSMA #	11-185
	however, is not completely fused, indicating the individual was approximately 20-21 years of age. No cranial suture closure has occurred.
Stature	Stature is estimated between 1607 mm (Neumann and Waldman) and 1619 mm (Genoves). Femoral maximum length is 433 mm (left) and in-position length is 429 mm (left). Laughlin provided a femoral length of 431 mm, providing a stature estimate of 1614 mm (Genoves).
Metric and Non-Metric Analysis	All cranial, maxillary and mandibular measurements were obtained. Nearly all non-metric traits were assessable. Post-cranial metrics were also completed. The innominates provided all measurements except left iliac breadth. The right femur was missing but the left provided all metrics. Laughlin provided measures of cranial length and breadth, bizygomatic, upper facial height (nasion-prosthion), height of mandibular symphysis, bigonial diameter, nasal height and width, orbital heights, and femoral length. His results varied from the current by 0-2 mm.
Dental Analysis	All maxillary teeth are present. All mandibular teeth are present, except for the right first and second molars which are missing antemortem, and the third molars which may be missing congenitally, or have not erupted. Bone resorption has occurred at the lower right first and second molar sites. Occlusal caries occurs in the lower left first molar. Dental wear is least in the upper third molars (20). The upper right first (45) and second (30) molars show less wear than the other teeth, probably due to the antemortem tooth loss opposite them in the lower jaw. The upper right second molar and left second molar are at 55, the right canine and first premolar, and left canine and premolars score 60, the upper lateral incisors score 65, the central incisors and left first molar score 70. All of the mandibular teeth have wear at level 60, except for the left second premolar (65) and the left first molar (70). There is a green stain (copper) on all left side teeth, mandible and maxilla, and on right lower incisors, The left side teeth are worn more than the right, probably due to the antemortem tooth loss of the lower right molars. This appears to have affected cranial morphology somewhat - the left mastoid process is much larger than the right, likely resulting from a shift in chewing pattern after tooth loss.

Burial #	Fuller #39
OSMA #	11-185

Pathology/ Anomaly

Occlusal caries occurs in the lower left first molar.

Lower third molars appear to be missing congenitally.

Antemortem tooth loss of the lower right molars, has apparently caused an asymmetric growth in the left mastoid process - it is much larger than the right, probably due to a shift in pattern of mastication after tooth loss.

The individual has a palatine torus.

Extra ossicles occur at both asterions, and in both sides of the lambdoid suture. In addition, an Inca bone is nearly formed at the lambda. The superior, left suture between this extra ossicle and the left parietal bone is not completely formed.

Laughlin notes an "ilio-sacral synostosis of right pelvis." Nothing was noted in current observation - the two bones are separate. This pathology, however, was not known to exist during analysis and not specifically looked for (i.e. it may have been overlooked).

Burial #	Fuller #40
OSMA #	none
Burial Type	Flexed
Side	Right
Orientation	Head to NW (Collins, Edmundson sketch)
Grave Type	unknown
Associations and Provenience	A large fire hearth lie just above burial. Pestle found in hearth. Penis bone (bear?) located just west of burial. Six inches north was found a cedar post extending to bottom of mound (may belong to fenceline or be prehistoric), also six inches north of the skull was a 12 inch vertical plank. Numerous cedar scraps were found beneath hearth and around the skeleton.... more below in Edmundson notes.... Located along "north fence of lane" and 26 (or 34?) inches west of post, 38 inches deep, and just north of fence.
Sex Estimate	Laughlin : Male Collins : Male Stepp : not available for study
Age Estimate	Laughlin : Adolescent Collins : Adolescent Stepp : not available for study
Stature Estimate	1681 mm - 1693 mm (from Laughlin femoral length)
Notes/Observations from previous researchers	Edmundson : cont. from above...(notes 3/1/42) "at 24 (inches), a stemmed scraper, or bunt of petrified wood appeared. Just above the skeleton, a 2 (inch) wide antler wedge, broken at the base, appeared." "At the right temple was the upper half of a bird's (larks) bill. In each nostril is a chunk of corroded iron round in section. About the right shoulder were a few olivellas. In the right hand was a corroded piece of flat iron... About the right wrist was a string of olivella and dentalium beads, plus copper. About the pelvis were a few olivellas arranged in 3 rows, ... a single small bone bead was found near the face." "On each foot were dentalium and small olivellas plus a 1/2 inch x 1/2 inch tube of iron. A row of olivellas extended up each fibula to near the top where at least a double row surrounded the leg. Most olivellas are wonderfully uniform in size....All shells and all bones lack the chalkiness so frequently seen. In other words the presence of iron proves this a recent burial, and the condition of bones and shells

Burial #	Fuller #40
OSMA#	none
Notes/Obs. cont...	bears this out. As noted in #39, olivellas appeared in the fill-in. Were the objects above the burial part of the ceremony, or were they chance finds? Again, more mussel shell appeared around and above the bones than one usually encounters. The same was true of fractured animal bones." Also noted that burial was at base of mound in very loose fill. "An adolescent, flathead male, thin skull broken in at the base-laterally distorted by the pressure of earth..." "One distal interphalangeal joint of hand fused" Laughlin : notes flattening as "frontal and occipital"
Case Description (Stepp)	Current location of remains is unknown, not at OSMA. Burial is flexed, lying on right side with head to the northwest. Collins states the burial was disturbed, but this is not clear from the notes. In fact the notes almost imply that the hearth and artifacts above the burial, may have been part of the ceremony. The association of abundant grave goods, including trade items with a cranially deformed individual is again noted.
Preservation and Inventory	Preservation was probably good, judging by notes. Preservation of shell and bone artifacts was at least good. Skull was thin and broken at base, and laterally distorted post-depositionally.
Sex Determination	Edmundson and Laughlin both assess individual as male.
Age at Death	Both Edmundson and Laughlin describe individual as an "adolescent."
Stature	Laughlin provides femoral length of 450 mm, which gives resulting stature estimates of 1681 mm (Genoves) and 1693 mm (Trotter and Gleser).
Metric and Non-Metric Analysis	Laughlin provides some cranial measurements including bizygomatic (131 mm), mentum-nasion (118 mm), upper-facial height (68 mm, similar to current nasion-prosthion?), height of mandibular symphysis (23 mm), bigonial (98 mm), nasal height (52 mm), nasal width (25 mm), head height (114 mm), orbits (left 41-40 mm, right 40-38 mm, believe this is orbital height), and femoral length (450 mm).
Dental Analysis	No dental analysis was completed.
Pathology/ Anomaly	One interphalangeal joint (distal) was noted as fused. Frontal and occipital (fronto-occipital) flattening of crania was noted.

Burial #	Fuller #41
OSMA #	11-186
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	No associations were reported in notes. Location was not recorded in notes.
Sex Estimate	Laughlin : none Collins : none Stepp : Male? (crania, pelvis)
Age Estimate	Laughlin : none Collins : none Stepp : 20 (18-21, pubic symphysis))
Stature Estimate	1678 mm - 1691 mm
Notes/Observations from previous researchers	Edmundson : No notes recorded on this individual Laughlin : In notes only records that this individual was "fragmentary." Collins : Lists only 40 burials from Fuller site.

Burial #	Fuller #41
OSMA#	11-186

Case Description (Stepp)

Remains are located at OSMA. Burial attributes are not recorded for this individual in the notes. The only references to Fuller #41 comes in pages presumably written by Laughlin and stating that this burial was "fragmentary." This is confusing since the individual labeled Fuller #41 and 11-186 held at OSMA is not fragmentary but relatively well-preserved. The source of this confusion is unknown.

Preservation and Inventory

Cranial elements present include both parietals, both temporals, both nasals, the maxilla, both malar, the frontal, occipital and fragmentary sphenoid (ala are present). The mandible is nearly complete, missing only its left condyle.

Post-cranial remains are also well-preserved. The third through seventh cervical, all thoracic and all lumbar vertebrae are present. The sacrum is also present but has fragmentary right auricular surface. The right innominate has a complete pubic bone and acetabulum but a fragmentary ischium and iliac blade, the left innominate has complete ischium, iliac blade, acetabulum but has fragmentary pubis and auricular surface. The left humerus is present, the right is nearly complete but has fragmentary proximal end. The right radius is complete, the left is nearly so but has fragmentary distal end. Both ulnae are complete. The right scapula has spine and corocoid process but fragmentary glenoid fossa and acromion, while the left has glenoid fossa and corocoid process only. Both clavicles are present. Both femora, and tibiae are present. The right fibula is complete, while the left is nearly so but with fragmentary proximal end. The right and left tali, calcaneus, and navicular, the right cuboid, the left first cuneiform, the right second and third cuneiform are present. All metatarsals are present except the right first metatarsal. All metacarpals are present. The right and left scaphoid are present. Twenty-one phalanges are present. There is an extra left talus marked 11-186, that obviously belongs to another individual.

Sex Determination

The individual is assessed as probable male (male?). Cranial traits indicating male include large mastoid processes, a wide palate, and dull upper edges of the orbits. Inominate sexing is slightly ambiguous but tends toward male - narrow sciatic notch, and narrow sacrum but a very shallow pre-auricular sulcus is present. Femoral head diameters are 43.0 mm (left) and 42.5 mm (right) in the range for probable female (female?) but it is noted that male femoral head diameters appear to be smaller for this population than as judge by Pearson's (i.e. more females were found than expected).

Age at Death

Age at death is determined from several sources including pubic symphysis morphology, dental eruption and wear, and epiphyseal union. Age is determined to be between 18 and 21 years.

The Gilbert and McKern (1973) method for aging the female os pubis provides an age estimate of 19.7 (18-21 years, composite score = 3).

Burial #	Fuller #41
OSMA #	11-186
	The upper third molars are not yet fully erupted and show no wear, while the lower third molars are note erupted or are missing congenitally. This suggests an age of 18-20 years. The spheno-occipital synchondrosous is not fused, indicating an age less than 21 years. No cranial suture closure has occurred. Several post-cranial epiphyses have not yet fused including the femoral head, head of humerus, iliac crest, vertebral bodies, clavicles, and some phalanges. The femoral head is usually fused by age 20, the humeral head by 25, the iliac crest by 23, clavicles by age 30, and iliac crest by age 23.
Stature	Stature is estimated between 1678 mm (Genoves) and 1691 mm (Trotter and Gleser). Neumann and Waldman formula provide estimates of 1681 mm (left) and 1683 mm (right). Femoral maximum lengths are 449 mm (left and right) and in-position lengths are 444 mm (left) and 446 mm (right).
Metric and Non-Metric Analysis	Cranial metrics were affected by the loss of basion which could not be estimated. Also, cranial deformation and asymmetric skull shape have certainly altered measurements. All measurements with basion were not possible, and the bizygomatic was estimated due to reconstruction of zygomatic arches. Mandibular measurements were affected by the missing left condyle and fragmentary gonion (both were estimated). No measure of the left ascending ramus height could be obtained. All maxillary measures were completed. Most cranial non-metric traits were assessable. Cranial deformation may have affected occurrence of some traits. Both femora were completely measured. The left innominate provided all measures except left iliac breadth and the right provided only the cotylo-sciatic breadth.
Dental Analysis	All maxillary teeth are present. The third molars are not yet fully erupted. All mandibular teeth are present, except the third molars which are either not erupted or missing congenitally (there is little room for them). Wear patterns vary from no wear (10) in the upper third molars, to 25 in the lower second molars, all upper premolars, the left upper lateral incisor, and the right upper canine, to 30 in the lower premolars and canines, the upper second molars, the upper left canine and the upper right lateral incisor, to 40 in the lower lateral incisors, to 45 in the first molars and central incisors.

Table 19. cont.

Burial #	Fuller #41
OSMA #	11-186
Pathology/ Anomaly	The upper central incisors exhibit shoveling. The cranium exhibits fronto-occipital deformation and is also asymmetric in shape, the right side longer than the left. The individual has a palatine torus. There is an extra ossicle in the right coronal suture. There are also extra ossicle in both sides of the lambdoid suture including one adjacent to the landmark lambda on the right side and two ossicles on the left.

Burial #	Fuller #xx
OSMA #	11-17 4
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown Provenience unknown
Sex Estimate	Laughlin : none Collins : none Stepp : none
Age Estimate	Laughlin : none Collins : none Stepp : > 21 years (dentition)
Stature Estimate	none
Notes/Observations from previous researchers	No previous identification of this individual.

Table 19. cont.

Burial #	Fuller #xx
OSMA#	11-174
Case Description (Stepp)	Remains are located at OSMA. These remains have no assigned burial number from Edmundson or Laughlin. They are marked with museum accession number "11-173~~4~~" (the 3 is struck through and four added). 11-173 is Fuller #25, but no mention is made of an extra individual with #25. Origin of these remains is unknown - but are here assumed to be part of the population - the museum received the remains from Fuller and Fanning in a group and in general assigned accession numbers in successional order, therefore these remains are most likely members of the group. Even if they are not, little effect on analysis will be felt as only maxillary metrics, a few non-metric assessments, and some dental analysis was possible.
Preservation and Inventory	Cranial elements present include the maxilla with malars attached and fragments of palatine. Post-cranial elements include only a single phalange.
Sex Determination	Sex is indeterminate. The palate is wide and malars are neither robust or gracile.
Age at Death	Dental eruption and heavy wear (levels 60-80) indicate an individual much older than 21 years.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	All maxillary measurements were completed. No other metrics are possible. Only those non-metric traits found in the maxilla and palatine ar assessable, including presence of accessory lesser palatine foramina, presence of palatine torus, and presence of zygomatico-facial foramina. All of these traits scored positive.
Dental Analysis	All maxillary tooth sites are present. Teeth present include on the right the central incisor, canine, second premolar, first and third molars, and on the left the lateral incisor, canine, and second premolar. The left central incisor and right lateral incisor are missing postmortem. The The right first premolar, and second molar and the left first premolar and all molars are missing antemortem with resultant bone resorption. Occlusal caries occurs at the left lateral incisor and canine and at the right first and third molars. The right first molar also has buccal caries and the right third molar also has lingual caries. Attrition level is least in the right third molar (level 30), possibly due to extensive caries in this tooth. All other teeth present exhibit heavy wear including level 70 on the left second premolar, the right canine, right second premolar and the right first molar. The heaviest wear (80, roots functioning in occlusal plane) occurs in the canine and lateral incisor and the right central incisor.
Pathology	Dental caries occurs in several teeth (see above).

Burial #	Fuller #xy
OSMA #	11-164
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown Provenience unknown
Sex Estimate	Laughlin : none Collins : none Stepp : Female (femoral head diameter)
Age Estimate	Laughlin : none Collins : none Stepp : > 20 years (epiphyses fused)
Stature Estimate	1515 mm - 1558 mm
Notes/Observations from previous researchers	No burial number associated with this element. No notes recorded.

Table 19. cont.

Burial #	Fuller #xy
OSMA#	11-164
Case Description (Stepp)	Remains located at OSMA. This is an isolated element (right femur) presumably from the Fuller site, although no burial number is assigned and no specific mention of this is made in notes. There are occasional references to isolated bones, however.
Preservation and Inventory	An isolated complete right femur is present.
Sex Determination	Femoral head diameter is 39.0 mm, suggesting a female individual.
Age at Death	The epiphyses are completely fused, indicating an individual over 20 years of age.
Stature	Stature is estimated between 1515 mm (Genoves) and 1559 mm (Neumann and Waldman).
Metric and Non-Metric Analysis	All metrics were obtainable.
Dental Analysis	No dental analysis could be completed.
Pathology/ Anomaly	No pathologies or anomalies were noted.

Burial #	Fuller #xz
OSMA #	11-169
Burial Type	unknown
Side	unknown
Orientation	unknown
Grave Type	unknown
Associations and Provenience	unknown
Sex Estimate	Laughlin : none Collins : none Stepp : none (too young)
Age Estimate	Laughlin : none Collins : none Stepp : 6-7 years (dentition)
Stature Estimate	none
Notes/Observations from previous researchers	No burial number associated with this isolated crania. No notes recorded.

Table 19. cont.

Burial #	Fuller #xz
OSMA#	11-169
Case Description (Stepp)	Remains located at OSMA. This is an isolated element (crania) presumably from the Fuller site, although no burial number is assigned and no specific mention of this is made in notes.
Preservation and Inventory	Cranial elements present include both parietals, the right temporal, both nasals, the maxilla, the right malar, and the frontal. Fragmentary elements include the left temporal, the left malar, the palatine, occipital and sphenoid. The mandible is not present. No post-cranial remains are present.
Sex Determination	No sex determination is made for this young individual.
Age at Death	All upper deciduous teeth are present (the right central incisor is loose in a bag marked "11-169 or 11-170"). The upper first permanent molars are erupted and show initial wear (20). The second permanent molars are present but not erupted. The individual is thus judged to be 6-7 years of age.
Stature	No stature estimate is possible.
Metric and Non-Metric Analysis	Cranial measurement was affected by the loss of several areas including basion, the foramen magnum, the left porion, and the left zygomatic arch. Cranial measurements possible included maximum length and breadth, minimum frontal breadth, nasal height and breadth, orbital breadths and heights, biorbital breadth, right porion-nasion, right porion-prosthion, maximum frontal breadth and nasion-prosthion. No mandibular measurements were possible (mandible missing). Maxillary measurements were all possible but the palatine length was estimated (palatine broken). Cranial non-metric traits were assessable in only some cases. Those associated with the occipital were mostly indeterminate as well as those of the left parietal. All cranial metrics and on-metrics were affected by cranial deformation (fronto-occipital) and asymmetry (probably from post-depositional deformation) of the skull. The right occipital and temporal bulge more than the left side. No post-cranial measurements were possible.
Dental Analysis	Maxillary teeth present include all deciduous teeth and the first and second permanent molars. The right central incisor is loose and in a bag labeled "169 or 170." The second permanent molars are not yet erupted but can be seen in the alveolus.

Burial #	Fuller #xz
OSMA #	11-169
	Dental attrition levels were assigned but it is noted that they may not apply to deciduous dentition. The left central incisor and canine and the right canine and first molar are scored at level 60. The left first molar scores 55, the left lateral incisor and the right incisors score 50, the second molars score 30. The two permanent first molars are just beginning to show wear (attrition level 20).
Pathology/ Anomaly	The individual exhibits fronto-occipital deformation. The cranium is also post-depositionally deformed, showing an asymmetry in which the right temporal and occipital bulge more than the left side.

Appendix B

Cranial Landmarks,
Cranial Metric Definitions and Technique,
Cranial Non-Metric Trait Description,
Post-Cranial Metric Definitions and Technique

Cranial Landmarks (after Olivier 1969)

Alveolare	Same as prosthion, the lowest point of the upper alveolar margin, between the two upper central incisors.
Basion	The anterior median point of the foramen magnum, taken on the outside of the skull.
Bregma	The meeting point of the coronal and sagittal sutures.
Dacryon	The point where the frontal, lacrymal, and maxillary sutures meet.
Ectoconchion	The point on the lateral margin of the orbit farthest from the maxillo-frontal point.
Endomolare	The most lateral point on the medial surface of the alveolar crest. (similar to ectomolare in Moore-Jansen and Jantz 1989)
Glabella	The most anterior part of the skull in the midline above the root of the nose.
Gnathion	The lowest midpoint of the inferior border of the mandible
Gonion	The point of intersection of the posterior tangent to the ascending ramus and the inferior tangent to the body of the mandible. In practice the lateral parts of the anatomical angles of the bone are used in determining gonia.
Infradentale	The highest midpoint of the inferior alveolar margin, between the two central incisors (of the mandible).
Maxillo-Frontal Point	The point situated on the maxillo-frontal suture in a prolongation of the anterior lacrymal crest, i. e. the internal margin of the frontal process of the maxillary bone.

Nasion	The point at which the suture dividing the two nasal bones meets the frontal bone.
Nasospinale	The point in the midline and on the tangent to the two lateral notches below the main part of the nasal orifices. If the margin of these notches is replaced by a nasal gutter one takes the level of the floor of the nasal fossae.
Opisthion	The midpoint of the posterior margin of the foramen magnum.
Opisthocranion	That point on the occipital bone which is farthest away (from glabella) in the median sagittal plane.
Orale	The midpoint of the posterior tangential line of the two upper median incisors.
Porion	The midpoint of the upper margin of the external auditory meatus.
Prosthion	The lowest point of the upper alveolar margin, between the two central incisors.
Staphylion	The median point of the anterior tangent to the posterior concavities of the bony palate.

Cranial Metrics (after Olivier 1969)

Maximum Length — The distance from glabella to opisthocranion as defined.

Maximum Breadth — The greatest transverse breadth of the calvarium taken in a horizontal plane, i. e. measurement points must always rest on symmetrically opposed points.

Basion-Bregma — The distance from basion to bregma as defined.

Minimum Frontal Breadth — The distance between the temporal lines on the frontal bone at their closest approach to one another. (Hall et. al. 1984)

Bizygomatic Breadth — The distance between the most lateral points of the zygomatic arches.

Nasal Height — The distance from nasion to nasospinale as defined.

Nasal Breadth — The maximum horizontal breadth of the nasal orifice.

Orbital Breadth — The distance from the maxillo-frontal point to ectoconchion as defined.

Orbital Height — The maximum distance between the upper and lower margins of the orbit, taken perpendicularly to the breadth. Upper and lower orbital notches are to be avoided in this measurement.

Biorbital Breadth — The distance from ectoconchion to ectoconchion as defined.

Basion-Porion — The distance from basion to porion as defined.

Porion-Nasion — The distance from porion to nasion as defined.

Porion-Prosthion The distance from porion to prosthion as defined.

Basion-Nasion The distance from basion to nasion as defined.

Maximum Frontal Breadth The distance between the most separated points of the frontal bone in the horizontal plane - usually along the coronal suture.

Basion-Prosthion The distance from basion to prosthion as defined.

Nasion-Prosthion The distance from nasion to prosthion as defined.

Foramen Magnum Length The distance from basion to opisthion as defined.

Mandible:

Symphysial Height The distance from gnathion to infradentale as defined.

Diameter Bigonial The distance from gonion to gonion as defined.

Diameter Bicondylar The maximum breadth taken between the most lateral parts of the mandibular condyles

Height of Ascending Ramus The distance from gonion to the most superior point on the upper part of the mandibular condyle.

Minimum Breadth of Ramus The minimum distance between the anterior and posterior margins of the ascending ramus, measured perpendicular to the height.

Gonial Angle The angle between the lines which define gonion - the posterior tangent to the ascending ramus and the inferior tangent to the border of the mandibular body.

Total Mandibular Length The distance between the most anterior point of the mental eminence to the plane which is tangent to the posterior part of the two condyles.

Height of Mandible at Pm1-Pm2 Height of mandibular body from the alveolar plane to the inferior border of the body at the line between the first and second premolars.

Height of Mandible at M2-M3 Height of mandibular body from the alveolar plane to the inferior border of the body at the line between the second and third molars.

Maxilla:

Palate Length The distance from orale to staphylion as defined.

Palate Breadth (internal) The distance between the two endomolare as defined.

Superior Alveolar Length The distance from alveolare to the tangent drawn across the ends of the alveolar processes.

Palate Breadth (external) The maximum distance across the lateral borders of the alveolar processes, perpendicular to the median plane.

Cranial Non-Metric Traits (after Berry and Berry 1967)

Highest Nuchal Line Present The inferior and superior nuchal lines form well-marked ridges running horizontally across the occipital bone. A third line (the highest) is sometimes present. It arises with the superior at the external occipital protuberance, and arches anteriorly and laterally, providing attachment for the epicranial eponeurosis. It is more easily felt than seen.

Ossicle at the Lambda A bone may occur at the junction of the sagittal and lambdoid sutures (the position of the posterior fontanelle).

Lambdoid Ossicle Present One or more ossicles may occur in the lambdoid suture. Up to about twelve distinct bones may be present on either side.

Parietal Foramen Present This pierces the parietal bone near the sagittal suture a few centimeters in front of the lambda. It transmits a small emissary vein, and sometimes a small branch of the occipital artery.

Bregmatic Bone Present A sutural bone (the bregmatic or interfrontal) may occur at the junction of the sagittal suture with the coronal one (the position of the anterior fontanelle).

Metopism The medio-frontal suture disappears within the first two years of life. In a few individuals it persists throughout life: this condition is known as metopism.

Coronal Ossicle Present Ossicles are sometimes found in the coronal suture.

Epipteric Bone Present A sutural bone (the epipteric bone or pterion ossicle) may be inserted between the anterior inferior angle of the parietal bone and the greater wing of the sphenoid. When large it may also articulate with the squamous part of the temporal bone.

Fronto-Temporal Articulation Normally the frontal bone is separated from the squamous part of the temporal bone by the greater wing of the sphenoid and the anterior inferior angle of the parietal bone. Occasionally the frontal and temporal bones are in direct contact, forming a fronto-temporal articulation.

Parietal Notch Bone Present The parietal notch is that part of the parietal bone that protrudes between the squamous and the mastoid portions of the temporal bone. It may form a separate ossicle which is known as the parietal notch bone.

Ossicle At Asterion The junction of the posterior inferior angle of the parietal bone with the occipital bone and mastoid portion of the temporal bone is known as the asterion. A sutural bone may occur at this junction.

Auditory Torus Present Rarely a bony ridge or torus is found on the floor of the external auditory meatus.

Foramen of Huschke Present This is a foramen occurring in the floor of the external auditory meatus. It is always present in young children but only occasionally does it persist after the fifth year. It is most easily scored from the inferior aspect of the tympanic part of the temporal bone.

Mastoid Foramen Exsutural When present the mastoid foramen usually lies in the suture between the mastoid part of the temporal bone and the occipital bone. Less frequently it lies exsuturally, piercing the mastoid part of the temporal bone, or more rarely, the occipital bone.

Mastoid Foramen Absent The mastoid foramen as described above may not be present.

Posterior Condylar Canal Patent The posterior condylar canal usually pierces the condylar fossa which lies immediately posterior to the occipital condyle. Sometimes it ends blindly in the bone, and has only been scored as patent when a seeker can be passed through it. Scoring this character is unsatisfactory in

skulls in poor condition because the bone of the condylar fossa is often fragile, so that a patent canal and a broken fossa are indistinguishable.

Condylar Facet Double Occasionally the articular surface of the occipital condyle is divided into two distinct facets.

Precondylar Tubercle Present Occasionally a bony tubercle lies immediately anterior and medial to the occipital condyle. A centrally placed tubercle has been regarded as two fused tubercles.

Anterior Condylar Canal Double This canal (foramen hypoglossi) pierces the anterior part of the occipital condyle and transmits the hypoglossal nerve. Embryologically the nerve originates from several segments and this may result in the canal being divided into two for part or all of its length. This is most easily scored by looking inside the foramen magnum.

Foramen Ovale Incomplete Rarely the postero-lateral wall of the foramen ovale is incomplete so that the foramen is continuous with the foramen spinosum.

Foramen Spinosum Open The posterior wall of the foramen spinosum is sometimes deficient. (This is another character difficult to score in skulls in poor condition).

Accessory Lesser Palatine Foramen Present The lesser palatine foramina lie on both sides of the posterior border of the hard palate immediately posterior to the greater palatine foramen, and transmit the lesser palatine nerves. When more than one (there may be three or four) foramina are present, it has been scored as accessory.

Palatine Torus Present Rarely a bony ridge runs longitudinally down the midline of the hard palate. This is the palatine torus.

Maxillary Torus Present The maxillary torus is a bony ridge running along the lingual aspects of the roots of the molar teeth.

Zygomatico-Facial Foramen Absent This is a small foramen which pierces the zygomatic bone opposite the junction of the infraorbital and lateral margins of the orbit. It transmits a nerve and small artery, and may be single, multiple or absent.

Supraorbital Foramen Complete The supraorbital foramen transmits the supraorbital vessels and nerve. It is frequently incomplete (or open). In this case it is often described as a "supraorbital notch".

Frontal Notch or Foramen Present A well-defined secondary foramen in the vicinity of (usually lateral to) the supraorbital foramen has been scored as a frontal foramen. Frequently a cluster of tiny foramina are present, but these have been ignored. Scoring is inevitably somewhat arbitrary in a few borderline cases.

Anterior Ethmoid Foramen Exsutural The anterior ethmoid foramen pierces the medial wall of the orbit. It normally lies on the suture between the medial edge of the orbital plates of the frontal and ethmoid bones, but it occasionally emerges above the suture.

Posterior Ethmoid Foramen Absent The posterior ethmoid foramen lies just behind the anterior ethmoid foramen on the same suture line. Its absence can only be scored satisfactorily in well-preserved skulls.

Accessory Infraorbital Foramen Present A second foramen may lie immediately adjacent to the infraorbital foramen.

Sagittal Bones Present Ossicles are sometimes found in the sagittal suture.

Post-Cranial Metrics (after Olivier 1969)

Femur:

Maximum Morphological Length — The maximum distance from the superior part of femoral head to the inferior portion of the medial condyle.

In-Position Length — The maximum distance from the inferior plane of the two condyles, to the superior portion of the femoral head.

Anteroposterior Diameter at Mid-Shaft — Diameter taken at midpoint along shaft, from anterior edge of bone to posterior edge (at linea aspera).

Transverse Diameter at Mid-Shaft — Diameter taken at midpoint along shaft from lateral edge to medial edge - perpendicular to anteroposterior diameter.

Circumference Mid-Shaft — Circumference of shaft at midpoint.

Maximum Head Diameter — The maximum diameter of femoral head. (Bass 1981).

Innominate:

Coxal Height The maximal distance between the highest point of the iliac crest and the lowest part of the ischium.

Iliac Breadth The rectilinear distance between the two superior iliac spines, anterior and posterior.

Cotylo-Sciatic Breadth Vertical distance from the posterior margin of the acetabulum to the middle of the lower leg of the great sciatic notch.

Ischial Length The rectilinear distance between the cotyloid point (the intersection of the long axis of the pubis and of the ischium) and the point where the ischial axis crosses the ischial tuberosity.

Appendix C

Metric Results

Table 20.

Adult Cranial Measurements (mm).

Table 20 Adult Cranial Measurements (mm).

1	Burial#	OSMA#	Sex	max length	max breadth	basion-bregma
2	FU15	11-165	female	164	133	132
3	FU34	11-182	female	•	•	•
4	FU36	11-184	female	•	•	•
5	FA01	11-187	female	•	137	•
6	FU12	11-158	female	167	135	•
7	FU09	11-161	female	•	143	•
8	FU07	11-156	female	•	•	•
9	FU25	11-173	female	168	141	•
10	FU13	11-159	female	178	142	•
11	FU35	11-183	female	•	•	•
12	FU26	11-175	female	171	140	137
13	FUxy	11-164	female	•	•	•
14	FU31	11-180	female	174	136	130
15	FU28	11-177	female	169	141	133
16	FU10*	11-162	female	169	140	132
17	FU39*	11-185	female	174	136	134
18	FU08	11-157	male	171	148	146
19	FU19	11-168	male	177	134	•
20	FA03	11-189	male	183	134	•
21	FU14	11-160	male	180	146	141
22	FU05	11-155	male	178	131	133
23	FU21	11-170	male	176	143	150
24	FU24	11-172	male	186	138	•
25	FU30	11-179	male	•	•	•
26	FU33	11-181	male	•	•	•
27	FA12	11-196	male	•	•	•
28	FA18b	11-199b	male	•	•	•
29	FA18a	11-199a	male	•	141	•
30	FA06	11-193	male	•	143	•
31	FA13	11-197	male	175	148	•
32	FU04*	11-154	male	175	149	140
33	FU41*	11-186	male	161	147	
34	FA07	11-194	•	•	•	•
35	FA14b	11-198b	•	•	•	•
36	FA04b	11-191	•	•	149	•
37	FU20	11-171	•	174	145	•
38	FA04a	11-190	•	•	•	•
39	FUxx	11-174	•	•	•	•
40	FA05*	11-192	•			
42	mean			174.4	140.4	137.75
43	s.d.			5.955	5.277	7.246

*Deformed individuals not included in calculation of means.

Table 20 continued. Adult Cranial Measurements (mm).

1	min frontal brdth	bizygomatic	nasal ht	nasal brdth	L orbital brdth	R orbital brdth
2	90.5	128.1	•	•	45.7	45.5
3	•	•	•	•	•	•
4	•	•	•	•	•	•
5	•	•	•	•	•	•
6	89	•	•	•	•	•
7	•	•	•	•	•	•
8	•	•	•	•	•	•
9	95	•	•	•	•	•
10	95	134	45.9	24.5	46.2	49.4
11	•	•	•	•	•	•
12	88	•	•	•	•	•
13	•	•	•	•	•	•
14	92	130	49.2	24	40.6	43
15	•	•	•	•	•	•
16	92	129	49.1	26.2	46.6	46.6
17	93	134	50.7	23.4	48.1	47.5
18	103	•	56	22.9	47.4	48.9
19	•	•	•	24.3	39.6	•
20	•	•	•	•	•	•
21	100	•	•	•	•	•
22	90	131	52.8	30.4	•	44.7
23	90	•	•	21.5	•	•
24	•	•	•	•	•	•
25	•	•	•	•	•	•
26	•	•	•	•	•	•
27	•	•	•	•	•	•
28	•	•	•	•	•	•
29	•	•	•	•	•	•
30	•	•	•	•	•	•
31	91.5	•	•	•	•	•
32	93	142.1	58.2	26.2	45	49.4
33	93	129	58	25.3	49.6	49.5
34	•	•	•	•	•	•
35	•	•	•	•	•	•
36	•	•	•	•	•	•
37	•	•	•	21.2	•	•
38	•	•	•	•	•	•
39	•	•	•	•	•	•
40						
42	93.091	130.775	50.975	24.114	43.9	46.3
43	4.748	2.464	4.377	3.069	3.541	2.76

*Deformed individuals not included in calculation of means.

Table 20 continued. Adult Cranial Measurements (mm).

1	L orbital ht	R orbital ht	biorbital brdth	L basion-porion	R basion-porion
2	35.5	•	93.5	58.8	62.8
3	•	•	•	•	•
4	•	•	•	•	•
5	•	•	•	•	•
6	•	•	•	•	•
7	•	•	•	•	•
8	•	•	•	•	•
9	•	•	•	•	•
10	38.2	35.4	98.1	•	•
11	•	•	•	•	•
12	•	•	•	63.8	67.2
13	•	•	•	•	•
14	36.7	34.5	97.9	64	62.5
15	•	•	•	64.8	63.7
16	35.8	35.9	96.9	60.9	62.2
17	37	35	98.9	64.5	64
18	•	37.9	108	72.2	72.1
19	•	•	•	•	•
20	•	•	•	•	•
21	•	•	•	66.6	64.9
22	37.9	34.1	98.5	60.7	67.1
23	•	•	•	66.1	69.7
24	•	•	•	•	•
25	•	•	•	•	•
26	•	•	•	•	•
27	•	•	•	•	•
28	•	•	•	•	•
29	•	•	•	•	•
30	•	•	•	72.1	71.3
31	•	•	•	•	•
32	35.9	34.4	101	69	71.2
33	40.3	39.3	99.9		
34	•	•	•	•	•
35	•	•	•	•	•
36	•	•	•	•	•
37	•	•	•	•	•
38	•	•	•	•	•
39	•	•	•	•	•
40					
42	37.075	35.81235.475	99.2	65.456	66.811
43	1.6	1.706	5.323	4.522	3.618

*Deformed individuals not included in calculation of means.

Table 20 continued. Adult Cranial Measurements (mm).

1	L porion-nasion	R porion-nasion	L porion-prosth	R porion-prosth	basion-nasion
2	106.8	107.4	•	•	95.1
3	•	•	•	•	•
4	•	•	•	•	•
5	•	•	•	•	•
6	•	•	•	•	•
7	•	•	•	•	•
8	•	•	•	•	•
9	113.7	•	•	•	•
10	111.5	109.8	125.3	118.2	•
11	•	•	•	•	•
12	115.5	116	•	•	102.4
13	•	•	•	•	•
14	109.3	110.9	120.4	123.4	97
15	107.5	108.4	•	•	94.8
16	105.3	107.1	120.8	122.7	96
17	110.5	112.6	123	123.1	106
18	116.1	121.7	126.2	122	109
19	115.8	111	•	•	•
20	112.4	•	•	•	•
21	114.4	113	•	•	105.1
22	115.2	119.3	119.4	122.2	108
23	113.7	115.4	•	•	109.7
24	•	•	•	•	•
25	•	•	•	•	•
26	115.2	•	•	•	•
27	•	•	•	•	•
28	•	•	•	•	•
29	•	•	•	•	•
30	•	•	•	•	•
31	104.7	109.8	•	•	•
32	114.7	117.9	131.7	130.2	105
33	109.3	117.9	115.5	120.7	
34	•	•	•	•	•
35	•	•	•	•	•
36	•	•	•	•	•
37	•	•	•	•	•
38	•	•	•	•	•
39	•	•	•	•	•
40	119.7				
42	112.271	112.973	122.825	121.45	102.637
43	3.75	4.599	3.422	2.253	6.271

*Deformed individuals not included in calculation of means.

Table 20 continued. Adult Cranial Measurements (mm).

1	max frontal brdth	basion-prosth	nasion-prosth	for. magnum lngth
2	116	•	•	29.1
3	•	•	•	•
4	•	•	•	•
5	•	•	•	•
6	109	•	•	•
7	•	•	•	•
8	•	•	•	•
9	117	•	•	•
10	117	•	66.6	•
11	•	•	•	•
12	113	•	•	37.9
13	•	•	•	•
14	114	103	66.9	35.8
15	117	•	•	37.2
16	114	98	72.8	37.4
17	117	107.3	70	
18	126	100.5	74.3	36.6
19	114	•	•	•
20	•	•	•	•
21	119	•	•	39
22	111	103	69.7	36.7
23	120	•	•	37.2
24	•	•	•	•
25	•	•	•	•
26	•	•	•	•
27	•	•	•	•
28	•	•	•	•
29	•	•	•	•
30	•	•	•	41.9
31	117	•	•	•
32	120.5	112	75.9	35.2
33	123		69.2	
34	•	•	•	•
35	•	•	•	•
36	•	•	•	•
37	121	•	•	•
38	•	•	•	•
39	•	•	•	•
40				
42	116.5	102.167	69.375	36.822
43	4.31	1.443	3.568	3.404

*Deformed individuals not included in calculation of means.

Table 21.

Adult Cranial Indices.

Table 21 Adult Cranial Indices.

Burial#	OSMA#	cranial index	mean ht.	cranial module	length-height	breadth-height
FU15	11-165	81.1	88.889	143	80.488	99.248
FU34	11-182	•	•	•	•	•
FU36	11-184	•	•	•	•	•
FA01	11-187	•	•	•	•	•
FU12	11-158	80.84	•	•	•	•
FU09	11-161	•	•	•	•	•
FU07	11-156	•	•	•	•	•
FU25	11-173	83.93	•	•	•	•
FU13	11-159	79.78	•	•	•	•
FU35	11-183	•	•	•	•	•
FU26	11-175	81.87	88.103	149.333	80.117	97.857
FUxy	11-164	•	•	•	•	•
FU31	11-180	78.16	83.871	146.667	74.713	95.588
FU28	11-177	83.43	85.806	147.667	78.698	94.326
FU10*	11-162	82.84	85.437	147	78.107	94.286
FU39*	11-185	78.16	86.452	148	77.011	98.529
FU08	11-157	86.55	91.536	155	85.38	98.649
FU19	11-168	75.71	•	•	•	•
FA03	11-189	73.22	•	•	•	•
FU14	11-160	81.11	86.503	155.667	78.333	96.575
FU05	11-155	73.6	86.084	147.333	74.719	101.527
FU21	11-170	81.25	94.044	156.333	85.227	104.895
FU24	11-172	74.19	•	•	•	•
FU30	11-179	•	•	•	•	•
FU33	11-181	•	•	•	•	•
FA12	11-196	•	•	•	•	•
FA18b	11-199b	•	•	•	•	•
FA18a	11-199a	•	•	•	•	•
FA06	11-193	•	•	•	•	•
FA13	11-197	84.57	•	•	•	•
FU04*	11-154	81.11	86.42	154.667	80	93.96
FU41*	11-186	91.3				
FA07	11-194	•	•	•	•	•
FA14b	11-198b	•	•	•	•	•
FA04b	11-191	•	•	•	•	•
FU20	11-171	83.33	•	•	•	•
FA04a	11-190	•	•	•	•	•
FUxx	11-174	•	•	•	•	•
FA05*	11-192					
mean		80.165	88.105	150.125	79.709	98.583
s.d.		4.579	3.328	4.931	4.074	3.393

*Deformed individuals not included in calculation of means.

Table 21 continued. Adult Cranial Indices.

Burial#	OSMA#	nasal index	fronto-parietal	orbital lt.	orbital rt.	upper facial
FU15	11-165	•	68.045	77.681	•	•
FU34	11-182	•	•	•	•	•
FU36	11-184	•	•	•	•	•
FA01	11-187	•	•	•	•	•
FU12	11-158	•	65.926	•	•	•
FU09	11-161	•	•	•	•	•
FU07	11-156	•	•	•	•	•
FU25	11-173	•	67.376	•	•	•
FU13	11-159	53.38	66.901	82.684	71.66	49.701
FU35	11-183	•	•	•	•	•
FU26	11-175	•	62.857	•	•	•
FUxy	11-164	•	•	•	•	•
FU31	11-180	48.78	67.647	90.394	80.233	51.462
FU28	11-177	•	•	•	•	•
FU10*	11-162	53.36	65.714	76.824	77.039	56.434
FU39*	11-185	46.15	68.382	76.923	73.684	52.239
FU08	11-157	40.89	69.595	•	77.505	•
FU19	11-168	•	•	•	•	•
FA03	11-189	•	•	•	•	•
FU14	11-160	•	68.493	•	•	•
FU05	11-155	57.58	68.702	•	76.286	53.206
FU21	11-170	•	62.937	•	•	•
FU24	11-172	•	•	•	•	•
FU30	11-179	•	•	•	•	•
FU33	11-181	•	•	•	•	•
FA12	11-196	•	•	•	•	•
FA18b	11-199b	•	•	•	•	•
FA18a	11-199a	•	•	•	•	•
FA06	11-193	•	•	•	•	•
FA13	11-197	•	61.824	•	•	•
FU04*	11-154	45.02	62.416	79.778	69.636	53.413
FU41*	11-186	43.62	63.265	81.25	79.394	53.643
FA07	11-194	•	•	•	•	•
FA14b	11-198b	•	•	•	•	•
FA04b	11-191	•	•	•	•	•
FU20	11-171	•	•	•	•	•
FA04a	11-190	•	•	•	•	•
FUxx	11-174	•	•	•	•	•
mean		50.157	66.391	83.586	76.421	51.456
s.d.		7.144	2.666	6.405	3.577	1.752

*Deformed individuals not included in calculation of means.

Table 22.

Measurements of Non- adult Crania (mm).

Table 22 Measurements of Non-Adult Crania (mm).

1	Burial#	OSMA#	Age	max length	max breadth	cranial index	basion-bregma
2	FU11	11-163	11-12 yrs	161	143	88.82	•
3	FU17	11-166	< 2 yrs	•	•	•	•
4	FU18	11-167	9-12 yrs	•	•	•	•
5	FU19	11-168	15-20 yrs	177	134	75.71	•
6	FU27	11-176	9-18 mo	•	•	•	•
7	FU29	11-178	5-12 yrs	•	•	•	•
8	FUxz	11-169	6-7 yrs	150	150	100	•
9	FA02	11-188	13-18 yrs	171	137	80.12	124
10	FA08	11-195	2-10 yrs	152	•	•	•
11	FA14a	11-198a	12-14 yrs	153	147	96.08	126
12	FA14c	11-198c	18-24 mo	•	•	•	•
13							
14							
15	mean			160.67	142.2	88.14	125
16	s.d.			11.147	6.686	10.285	1.414

Table 22 continued. Measurements of Non-Adult Crania (mm).

1	min frontal brdth	bizygomatic	nasal ht	nasal brdth	nasal index	L orbital brdth
2	91	•	•	20.2	•	•
3	•	•	•	•	•	•
4	•	•	•	•	•	•
5	•	•	•	24.3	•	39.6
6	•	•	•	•	•	•
7	•	•	•	•	•	•
8	92	•	42.9	20.2	47.09	38.5
9	93	128	47.6	22.5	47.27	42.2
10	83	•	•	•	•	•
11	89	•	49.9	21.8	43.69	40.2
12	•	•	•	17.2	•	30.3
13						
14						
15	89.6	128	46.8	21.03	46.01	38.16
16	3.975	-	3.568	2.429	2.017	4.595

Table 22 continued. Measurements of Non-Adult Crania (mm).

1	R orbital brdth	L orbital ht	R orbital ht	biorbital brdth	L basion-porion
2	•	•	•	91.9	•
3	•	•	•	•	•
4	•	•	•	•	•
5	•	•	•	•	•
6	•	•	•	•	•
7	•	•	•	•	•
8	41.1	32.6	33.6	90.9	•
9	43.7	33.3	32.4	96.9	61.8
10	•	•	•	•	•
11	40.2	34.1	34.4	88.4	62.1
12	29.2	•	•	69	•
13					
14					
15	38.55	33.33	33.467	87.42	61.95
16	6.408	0.751	1.007	10.751	0.212

Table 22 continued. Measurements of Non-Adult Crania (mm).

1	R basion-porion	L porion-nasion	R porion-nasion	L porion-prosth	R porion-prosth
2	•	102.8	101.9	•	•
3	•	•	•	•	•
4	•	•	•	•	•
5	•	115.8	111	•	•
6	•	•	•	•	•
7	•	•	•	•	•
8	•	•	96.3	•	98.4
9	58.7	113.8	109.8	119.8	117.5
10	•	•	•	•	•
11	61.2	102.7	106.7	117.7	120.6
12	•	•	•	•	•
13					
14					
15	59.95	108.78	105.14	118.75	112.17
16	1.768	7.005	6.065	1.485	12.023

Table 22 continued. Measurements of Non-Adult Crania (mm).

1	basion-nasion	max frontal brdth	basion-prosth	nasion-prosth	for. magnum lngth
2	•	120	•	•	•
3	•	•	•	•	•
4	•	•	•	•	•
5	•	114	•	•	•
6	•	•	•	•	•
7	•	•	•	•	•
8	•	114	•	57	•
9	101	112	101.5	67.1	•
10	•	•	•	•	•
11	87	116	97	63.9	31.7
12	•	•	•	•	•
13					
14					
15	94	115.2	99.25	62.67	31.7
16	9.899	3.033	3.182	5.162	-

Table 23.

Measurements of the Maxilla (mm).

Table 23 Measurements of the Maxilla.

Burial#	OSMA#	PL	IPB	SAL	EPB
FU01		•	•	•	•
FU02		•	•	•	•
FU03		•	•	•	•
FU04	11-154	•	48.8	58.1	69.7
FU05	11-155	•	46.6	53.6	64.8
FU06		•	•	•	•
FU07	11-156	•	•	•	•
FU08	11-157	•	44.9	52.7	68.8
FU09	11-161	•	•	•	•
FU10	11-162	45.9	40.3	56.1	62.6
FU11	11-163	46.9	38.6	48.8	63.6
FU12	11-158	•	•	•	•
FU13	11-159	•	37.2	•	58.5
FU14	11-160	55.3	42.6	66.5	59.9
FU15	11-165	•	•	•	•
FU16		•	•	•	•
FU17	11-166	•	•	•	•
FU18	11-167	•	39.5	48	60.6
FU19	11-168	•	38.8	52.1	64.4
FU20	11-171	47.1	40.8	49	63.8
FU21	11-170	•	34.8	53.6	60.6
FU22		•	•	•	•
FU23		•	•	•	•
FU24	11-172	•	•	•	•
FU25	11-173	•	30.4	58.8	56
FU26	11-175	•	•	•	•
FU27	11-176	•	•	•	•
FU28	11-177	47.6	40.3	•	50.5
FU29	11-178	•	•	•	•
FU30	11-179	•	•	•	•
FU31	11-180	35.5	38.5	40.1	59.4
FU32		•	•	•	•
FU33	11-181	•	•	51.9	•
FU34	11-182	•	•	•	•

PL = palate length
IPB = internal palate breadth
SAL = superior alveolar length
EPB = external palate breadth

Table 23 continued. Measurements of the Maxilla.

FU35	11-183	•	•	•	•
FU36	11-184	•	•	•	•
FU37		•	•	•	•
FU38		•	•	•	•
FU39	11-185	48.2	40.7	52.2	63.6
FU40		•	•	•	•
FU41	11-186	46.9	42.9	52	66.9
FUxx	11-174	47.3	45	54.7	63.5
FUxy	11-164	•	•	•	•
FUxz	11-169	34.1	32.1	35.3	55.9
FA01	11-187	•	•	•	•
FA02	11-188	37	37.9	49.1	62.6
FA03	11-189	51	42.8	55.8	63
FA04a	11-190	•	•	•	•
FA04b	11-191	•	•	•	•
FA05	11-192	39.2	46.3	54.8	65.1
FA06	11-193	•	•	•	•
FA07	11-194	•	•	•	•
FA08	11-195	•	•	•	•
FA09		•	•	•	•
FA10		•	•	•	•
FA11		•	•	•	•
FA12	11-196	•	45.6	60.2	65.6
FA13	11-197	•	•	•	•
FA14a	11-198a	40.9	39.4	51.6	63.4
FA14b	11-198b	•	•	•	•
FA14c	11-198c	•	23.4	30.2	46.7
FA15		•	•	•	•
FA16		•	•	•	•
FA17		•	•	•	•
FA18a	11-199a	•	•	•	•
FA18b	11-199b	•	•	•	•
mean		44.493	39.925	51.53	61.646
s.d.		6.181	1.159	7.826	5.291

PL = palate length
IPB = internal palate breadth
SAL = superior alveolar length
EPB = external palate breadth

Table 24.

Measurement of the Mandible (mm).

Table 24 Measurements of the Mandible.

Burial#	OSMA#	SH	Big.	Bic.	HR-L	HR-R	BR-L	BR-R	GA	TML	HP-L	HP-R	HM-L	HM-R
FU01		•	•	•	•	•	•	•	•	•	•	•	•	•
FU02		•	•	•	•	•	•	•	•	•	•	•	•	•
FU03		•	•	•	•	•	•	•	•	•	•	•	•	•
FU04	11-154	32	100	126	71.3	72.4	35.1	33.9	121	113	35.4	34.9	26.5	30.2
FU05	11-155	32.2	100	120	62.2	•	31.3	•	135	111	29.9	29.2	16.9	16.3
FU06		•	•	•	•	•	•	•	•	•	•	•	•	•
FU07	11-156	•	•	•	48.8	•	31.8	•	135	•	31.5	•	22.5	•
FU08	11-157	•	•	•	63.5	60	36.3	33.1	124	•	•	34.9	29	29.3
FU09	11-161	•	•	•	•	•	•	•	•	•	•	•	•	•
FU10	11-162	33.1	94.5	118	57.2	60.9	31.8	•	124	105	32.7	31.2	23.8	23.6
FU11	11-163	29.6	93.7	116	55.9	57.7	29.9	30.5	128	95	26.7	27.9	26.7	24.2
FU12	11-158	•	•	•	•	•	•	•	•	•	•	•	•	•
FU13	11-159	•	•	•	•	•	•	•	•	•	•	•	•	•
FU14	11-160	30.5	100	123	•	75.1	34.8	36.4	116	104	31.6	31	29.8	30.9
FU15	11-165	25.7	102	•	•	•	•	28.5	•	•	•	25	•	14.5
FU16		•	•	•	•	•	•	•	•	•	•	•	•	•
FU17	11-166	•	•	•	•	•	•	•	•	•	•	•	•	•
FU18	11-167	29.7	•	•	44.9	48	•	29.4	131r	95	21.9	20.2	•	20
FU19	11-168	28.7	95.4	115	64	61.2	36	35.4	119	97	30.7	32.2	28.9	30.8
FU20	11-171	•	•	•	•	•	•	32.2	•	•	•	•	•	•
FU21	11-170	34.4	105	132	65.3	62.5	35.5	35	119	100	32.1	35.5	27.4	29.3
FU22		•	•	•	•	•	•	•	•	•	•	•	•	•
FU23		•	•	•	•	•	•	•	•	•	•	•	•	•
FU24	11-172	•	•	•	•	•	34.1	34.8	122r	•	•	•	•	•
FU25	11-173	33.1	96.7	•	•	•	34.8	34.6	•	•	33.4	30.2	23.2	22
FU26	11-175	34.6	100	•	•	•	29	28	•	•	25	26.9	21.4	12.6
FU27	11-176	•	•	•	•	•	•	•	•	•	•	•	•	•
FU28	11-177	29.1	•	•	•	•	•	•	•	•	26.5	•	28	•
FU29	11-178	•	•	•	•	•	•	•	•	•	•	•	•	•
FU30	11-179	36.6	•	•	67.3	•	26.4	•	110	104	32.8	33.4	26.1	26.8
FU31	11-180	29.1	101	120	59.2	•	35.2	31.9	123	98	26.6	28.5	23.8	25.8
FU32		•	•	•	•	•	•	•	•	•	•	•	•	•
FU33	11-181	28.6	105	114	63.8	64	34.8	34.5	119	103	25	28.5	26.3	23.9
FU34	11-182	•	•	•	•	•	•	•	•	•	30.5	35.1	25.9	28.7

SH = symphyseal height Big. = bigonial diameter Bic. = bicondylar diameter
HR-L = height of ascending ramus, left side
HR-R = height of ascending ramus, right side
BR-L = minimum breadth of ramus, left side
BR-R = minimum breadth of ramus, right side
GA = gonial angle TML = total mandibular length
HP-L = height of mandible at PM1-PM2, left side
HP-R = height of mandible at PM1-PM2, right side
HM-L = height of mandible at M2-M3, left side
HM-R = height of mandible at M2-M3, right side

Table 24 continued. Measurements of the Mandible.

FU35	11-183	•	•	•	•	•	•	•	•	•	•	•	•	•
FU36	11-184	22.8	95	107	•	49	•	30.3	135r	105	•	19.9	•	10
FU37		•	•	•	•	•	•	•	•	•	•	•	•	•
FU38		•	•	•	•	•	•	•	•	•	•	•	•	•
FU39	11-185	33.2	95.2	115	65.1	68.7	31.4	32.1	126	102	34.4	33.8	27.2	22.4
FU40		•	•	•	•	•	•	•	•	•	•	•	•	•
FU41	11-186	27.1	94.6	107	•	57.9	28.6	31	121r	97	26.7	26.5	25.9	25.1
FUxx	11-174	•	•	•	•	•	•	•	•	•	•	•	•	•
FUxy	11-164	•	•	•	•	•	•	•	•	•	•	•	•	•
FUxz	11-169	•	•	•	•	•	•	•	•	•	•	•	•	•
FA01	11-187	•	•	•	•	•	•	•	•	•	•	•	•	•
FA02	11-188	28.6	106	111	60.5	•	33.9	33	127	97	26.3	26.6	25	23.9
FA03	11-189	33.2	109	115	64.9	•	28.8	30.7	131	100	28.8	32.2	26	28.2
FA04a	11-190	•	•	•	•	•	•	•	•	•	•	•	•	•
FA04b	11-191	29.8	109	120	59.3	60	34.7	35.8	126	105	29.9	32.8	22	19.8
FA05	11-192	31.4	107	120	57.5	59.3	35.6	34.9	121	108	30.6	29.4	25.4	24.6
FA06	11-193	•	•	•	•	•	•	•	•	•	•	•	•	29.1
FA07	11-194	•	•	•	•	•	•	•	•	•	•	•	•	•
FA08	11-195	•	•	•	•	•	•	•	•	•	•	•	•	•
FA09		•	•	•	•	•	•	•	•	•	•	•	•	•
FA10		•	•	•	•	•	•	•	•	•	•	•	•	•
FA11		•	•	•	•	•	•	•	•	•	•	•	•	•
FA12	11-196	•	•	•	71.3	•	34.5	•	121	112	31.9	•	26.9	•
FA13	11-197	•	•	•	•	•	•	•	•	•	•	•	•	•
FA14a	11-198a	•	•	•	•	•	•	•	•	•	•	•	•	•
FA14b	11-198b	•	•	•	•	•	•	•	•	•	•	•	•	•
FA14c	11-198c	•	•	•	•	•	•	•	•	•	•	•	•	•
FA15		•	•	•	•	•	•	•	•	•	•	•	•	•
FA16		•	•	•	•	•	•	•	•	•	•	•	•	•
FA17		•	•	•	•	•	•	•	•	•	•	•	•	•
FA18a	11-199a	27.2	96.7	117	59.4	57.1	32.5	31	125	100	21.4	19.7	17.5	15
FA18b	11-199b	•	•	•	•	•	•	•	•	•	•	•	•	•
									?					
mean		30.4	101	118	61.1	60.9	32.9	32.6	124	103	29.3	29.4	25.1	23.5
s.d.		3.2	5.3	6.2	6.7	7.3	2.8	2.4	6.2	5.5	3.8	4.7	3.3	6

SH = symphyseal height Big. = bigonial diameter Bic. = bicondylar diameter
HR-L = height of ascending ramus, left side
HR-R = height of ascending ramus, right side
BR-L = minimum breadth of ramus, left side
BR-R = minimum breadth of ramus, right side
GA = gonial angle TML = total mandibular length
HP-L = height of mandible at PM1-PM2, left side
HP-R = height of mandible at PM1-PM2, right side
HM-L = height of mandible at M2-M3, left side
HM-R = height of mandible at M2-M3, right side

Table 25.

Length Measurements of the Femur,
Maximum Morphological Length, and In-position Length (mm).

Table 25 Length Measurements of the Femur, maximum morphological length and in-position length (mm).

Burial#	OSMA#	max morph. -L	max morph. -R	in-position -L	in-position -R
FU01		•	•	•	•
FU02		•	•	•	•
FU03		•	•	•	•
FU04	11-154	•	•	•	•
FU05	11-155	428	428	425	422
FU06		•	•	•	•
FU07	11-156	395	396	393	382
FU08	11-157	•	414	•	407
FU09	11-161	•	•	•	•
FU10	11-162	•	•	•	•
FU11	11-163	•	•	•	•
FU12	11-158	•	403	•	400
FU13	11-159	395	400	389	388
FU14	11-160	•	•	•	•
FU15	11-165	•	•	•	•
FU16		•	•	•	•
FU17	11-166	•	•	•	•
FU18	11-167	•	•	•	•
FU19	11-168	396	•	•	•
FU20	11-171	386	•	383	•
FU21	11-170	424	424	421	422
FU22		•	•	•	•
FU23		•	•	•	•
FU24	11-172	402	398	399	396
FU25	11-173	405	404	402	398
FU26	11-175	421	419	415	412
FU27	11-176	•	•	•	•
FU28	11-177	•	•	•	•
FU29	11-178	•	•	•	•
FU30	11-179	484	•	483	•
FU31	11-180	404	395	398	391
FU32		•	•	•	•
FU33	11-181	•	415	•	396
FU34	11-182	•	•	•	•
FU35	11-183	•	•	•	•
FU36	11-184	•	•	•	•
FU37		•	•	•	•
FU38		•	•	•	•
FU39	11-185	433	•	429	•
FU40		•	•	•	•
FU41	11-186	449	449	444	446

Table 25 continued. Length Measurements of the Femur, maximum morphological length and in-position length (mm).

FUxx	11-174	•	•	•	•
FUxy	11-164	•	393	•	389
FUxz	11-169	•	•	•	•
FA01	11-187	•	411	•	409
FA02	11-188	•	•	•	•
FA03	11-189	•	•	•	•
FA04a	11-190	•	•	•	•
FA04b	11-191	432	432	429	429
FA05	11-192	•	•	•	•
FA06	11-193	•	•	•	•
FA07	11-194	•	416	•	414
FA08	11-195	•	•	•	•
FA09		•	•	•	•
FA10		•	•	•	•
FA11		•	•	•	•
FA12	11-196	•	455	•	450
FA13	11-197	•	•	•	•
FA14a	11-198a	•	365	•	361
FA14b	11-198b	•	•	•	•
FA14c	11-198c	•	•	•	•
FA15		•	•	•	•
FA16		•	•	•	•
FA17		•	•	•	•
FA18a	11-199a	•	408	•	401
FA18b	11-199b	441	444	440	440
mean		419.667	413.45	417.857	407.65
s.d.		26.128	21.392	26.893	22.422
		•	•	•	•

Table 26.

Other Measurements of the Femur (mm).

Table 26 Other Measurements of the Femur (mm).

Burial#	OSMA#	APD-L	APD-R	TD-L	TD-R	FC-L	FC-R	DH-L	DH-R
FU01		•	•	•	•	•	•	•	•
FU02		•	•	•	•	•	•	•	•
FU03		•	•	•	•	•	•	•	•
FU04	11-154	•	•	•	•	•	•	•	•
FU05	11-155	23.3	22.8	23.5	23.9	74	74	41.6	42.2
FU06		•	•	•	•	•	•	•	•
FU07	11-156	22.4	21.8	20.1	20.3	66	67	38.6	37.5
FU08	11-157	27.7	27.2	28.2	27.6	87	86	45.5	45.5
FU09	11-161	•	•	•	•	•	•	•	•
FU10	11-162	•	•	•	•	•	•	•	•
FU11	11-163	•	•	•	•	•	•	•	•
FU12	11-158	25.2	24.2	23.2	24.5	75	77	40.2	39.3
FU13	11-159	21.2	22.4	20.5	21.9	70	71	38.8	39.6
FU14	11-160	29.6	30.3	27.3	26.7	88	91	43.2	42.9
FU15	11-165	22.4	23.1	24	23.5	72.5	73	39.3	39
FU16		•	•	•	•	•	•	•	•
FU17	11-166	•	•	•	•	•	•	•	•
FU18	11-167	18.4	•	17.8	•	57	•	33.8	33.4
FU19	11-168	24.4	24.2	21.5	21.8	75	72	42.6	•
FU20	11-171	22	21.1	22	20.9	69	67	40	39.6
FU21	11-170	25.7	25.9	26	26.1	82	82.5	44.4	45.5
FU22		•	•	•	•	•	•	•	•
FU23		•	•	•	•	•	•	•	•
FU24	11-172	28.8	26.8	25	24.1	86	82	44	43.5
FU25	11-173	23.4	24.9	24.4	24.8	77	78	41.3	41.2
FU26	11-175	25.3	25.1	24.9	24.4	79.5	77	40.8	40.9
FU27	11-176	13.1	13.1	13.4	14.2	43	43	•	•
FU28	11-177	23.1	22.5	23.5	23.8	74.5	74	•	•
FU29	11-178	19.7	•	18.1	•	60.5	•	•	•
FU30	11-179	28.6	28.7	27.7	26.4	88	87	47	•
FU31	11-180	22.5	22.8	23.1	23.3	71	71	38.9	38
FU32		•	•	•	•	•	•	•	•
FU33	11-181	24	23.2	25.3	25	76	77	44.9	44.1
FU34	11-182	20.3	20.3	20.2	21.3	63	66	•	•
FU35	11-183	21.1	•	24.1	•	72	•	•	•
FU36	11-184	25.5	25.4	22.2	22	77	78	37.4	37.3
FU37		•	•	•	•	•	•	•	•
FU38		•	•	•	•	•	•	•	•

APD-L = anterior-posterior diameter, left side
APD-R = anterior posterior diameter, right side
TD-L = transverse diameter, left side
TD-R = transverse diameter, right side
FC-L = femur circumference mid-shaft, left side
FC-R = femur circumference mid-shaft, right side
DH-L = femoral head diameter, left side
DH-R = femoral head diameter, right side

Table 26 continued. Other Measurements of the Femur (mm).

FU39	11-185	24	•	27.3	•	78	•	43.3	•
FU40		•	•	•	•	•	•	•	•
FU41	11-186	23.5	23.5	20.4	21	69	69.5	43	42.5
FUxx	11-174	•	•	•	•	•	•	•	•
FUxy	11-164	•	24.5	•	23.5	•	75	•	39
FUxz	11-169	•	•	•	•	•	•	•	•
FA01	11-187	23.8	23.7	23	23.4	73	74	•	37
FA02	11-188	•	22.9	•	22.4	•	71.5	•	•
FA03	11-189	•	•	•	•	•	•	•	•
FA04a	11-190	•	•	•	•	•	•	•	•
FA04b	11-191	27	27.4	24.6	25	81	82.5	44	44
FA05	11-192	•	•	•	•	•	•	•	•
FA06	11-193	•	30.2	•	25.5	•	99	50.6	•
FA07	11-194	28.4	28.1	22.9	23	81.5	82	•	41.1
FA08	11-195	•	•	•	•	•	•	•	•
FA09		•	•	•	•	•	•	•	•
FA10		•	•	•	•	•	•	•	•
FA11		•	•	•	•	•	•	•	•
FA12	11-196	27.6	28.4	23.4	22.9	83	82	•	•
FA13	11-197	•	•	•	•	•	•	•	•
FA14a	11-198a	21.9	23	19.8	19.5	66	69	37.9	38.1
FA14b	11-198b	•	•	•	•	•	•	•	•
FA14c	11-198c	•	•	•	•	•	•	•	•
FA15		•	•	•	•	•	•	•	•
FA16		•	•	•	•	•	•	•	•
FA17		•	•	•	•	•	•	•	•
FA18a	11-199a	23.4	23.7	23.5	25.8	77	78	•	42.8
FA18b	11-199b	28.5	27.7	23.6	24.1	81	81	44.6	45.6
mean		23.931	24.481	22.953	23.31	74.141	76.032	41.904	40.817
s.d.		3.482	3.357	3.124	2.579	9.583	9.588	3.597	3.15

APD-L = anterior-posterior diameter, left side
APD-R = anterior posterior diameter, right side
TD-L = transverse diameter, left side
TD-R = transverse diameter, right side
FC-L = femur circumference mid-shaft, left side
FC-R = femur circumference mid-shaft, right side
DH-L = femoral head diameter, left side
DH-R = femoral head diameter, right side

Table 27.

Measurements of the Innominates (mm).

Table 27 Measurements of the Innominates (mm).

Burial#	OSMA#	CH-L	CH-R	IB-L	IB-R	CSB-L	CSB-R	IL-L	IL-R
FU01		•	•	•	•	•	•	•	•
FU02		•	•	•	•	•	•	•	•
FU03		•	•	•	•	•	•	•	•
FU04	11-154	•	•	•	•	•	•	•	•
FU05	11-155	193	•	•	•	38.9	•	79.9	•
FU06		•	•	•	•	•	•	•	•
FU07	11-156	•	•	•	•	33.3	•	•	•
FU08	11-157	210	•	157	•	36.5	•	92	•
FU09	11-161	•	•	•	•	•	•	•	•
FU10	11-162	187	191	•	145	34.3	33.7	85.2	84.2
FU11	11-163	•	•	•	•	•	•	•	•
FU12	11-158	•	198	•	•	36	35.5	•	•
FU13	11-159	•	•	•	•	34.4	•	80.1	•
FU14	11-160	•	•	•	140	•	•	•	•
FU15	11-165	•	•	•	•	32	•	•	•
FU16		•	•	•	•	•	•	•	•
FU17	11-166	•	•	•	•	•	•	•	•
FU18	11-167	•	•	105	112	•	•	•	•
FU19	11-168	•	•	•	•	•	•	•	•
FU20	11-171	•	•	131	134	30.9	27.9	78.8	76.3
FU21	11-170	•	212	•	144	33.3	37.1	•	97.5
FU22		•	•	•	•	•	•	•	•
FU23		•	•	•	•	•	•	•	•
FU24	11-172	•	•	•	•	•	•	•	•
FU25	11-173	•	•	•	•	33.6	•	•	•
FU26	11-175	•	208	163	160	35	37.3	84.6	89.8
FU27	11-176	•	•	89	•	•	•	•	•
FU28	11-177	•	•	•	•	•	•	•	•
FU29	11-178	•	•	•	•	•	•	•	•
FU30	11-179	192	194	150	148	31.7	31.8	78	81.6
FU31	11-180	•	•	•	•	•	•	85.8	•
FU32		•	•	•	•	•	•	•	•
FU33	11-181	•	200	141	143	36.8	•	•	85.8
FU34	11-182	•	•	•	•	•	•	•	•
FU35	11-183	•	•	•	•	•	•	•	•
FU36	11-184	•	•	•	•	•	•	•	•
Burial#	OSMA#	CH-L	CH-R	IB-L	IB-R	CSB-L	CSB-R	IL-L	IL-R

CH-L = coxal height left
CH-R = coxal height right
IB-L = iliac breadth left
IB-R = iliac breadth right
CSB-L = cotylo-sciatic breadth left
CSB-R = cotylo-sciatic breadth right
IL-L = ischial length left
IL-R = ischial length right

Table 27 continued. Measurements of the Innominates (mm).

FU37		•	•	•	•	•	•	•	•
FU38		•	•	•	•	•	•	•	•
FU39	11-185	206	211	•	150	36.8	37.3	86.9	92.4
FU40		•	•	•	•	•	•	•	•
FU41	11-186	201	•	•	•	32.1	30.9	85.5	•
FUxx	11-174	•	•	•	•	•	•	•	•
FUxy	11-164	•	•	•	•	•	•	•	•
FUxz	11-169	•	•	•	•	•	•	•	•
FA01	11-187	•	•	•	•	•	•	•	•
FA02	11-188	•	•	•	•	•	•	•	•
FA03	11-189	•	•	•	•	•	•	•	•
FA04a	11-190	•	•	•	•	•	•	•	•
FA04b	11-191	•	197	•	105.6	•	37.1	•	90.6
FA05	11-192	•	•	•	•	•	•	•	•
FA06	11-193	•	•	•	•	•	•	•	•
FA07	11-194	•	•	•	149	•	•	•	•
FA08	11-195	•	•	•	•	•	•	•	•
FA09		•	•	•	•	•	•	•	•
FA10		•	•	•	•	•	•	•	•
FA11		•	•	•	•	•	•	•	•
FA12	11-196	•	•	•	•	•	36.9	•	•
FA13	11-197	•	•	•	•	•	•	•	•
FA14a	11-198a	•	•	119	120	29.1	30.8	•	•
FA14b	11-198b	•	•	•	•	•	•	•	•
FA14c	11-198c	•	•	•	•	•	•	•	•
FA15		•	•	•	•	•	•	•	•
FA16		•	•	•	•	•	•	•	•
FA17		•	•	•	•	•	•	•	•
FA18a	11-199a	•	•	•	•	•	34.5	•	•
FA18b	11-199b	•	•	155	154	•	•	•	•
mean		198.16	201.37	134.44	138.81	34.044	34.233	83.68	87.275
s.d.		8.931	7.963	25.53	16.523	2.567	3.209	4.394	6.682

CH-L = coxal height left
IB-L = iliac breadth left
CSB-L = cotylo-sciatic breadth left
IL-L = ischial length left

CH-R = coxal height right
IB-R = iliac breadth right
CSB-R = cotylo-sciatic breadth right
IL-R = ischial length right

Appendix D

Criteria for Determining Dental Attrition Levels

Appendix D

Criteria for Determing Dental Attrition Level

Attrition Level	Incisors and Canines	Premolars	Molars
10	Unworn	Unworn	Unworn
20	Wear facets minimal; no observable dentine.	Wear facets present; no observable dentine.	Wear facets; no observable dentine.
25	Small dentine patches visible; cusp not obliterated.	Small dentine patches; cusp pattern not obliterated.	Small dentine patches; cusp pattern not obliterated.
30	Cusp pattern obliterated; dentine patches present.	Cusp pattern partially obliterated; small dentine patches.	Cusp pattern partially or completely obliterated; small dentine patches.
40	Dentine patch (minimal).	Two or more dentine patches, one of large size.	Three or more small dentine patches.
50	Dentine patch (extensive).	Two or more dentine patches; secondary dentine may be slight.	Three or more large dentine patches; secondary dentine none to slight.
60	Secondary dentine (moderate to extensive).	Entire tooth still surrounded by enamel, secondary dentine moderate to heavy.	Secondary dentine moderate to extensive; entire tooth completely surrounded by enamel.
70	Crown (enamel) worn away on at least one side; extensive secondary dentine.	Crown (enamel) worn away on at least one side; extensive secondary dentine.	Crown (enamel) worn away on at least one side; extensive secondary dentine.
75	Everything worn to neck just above roots.	Everything worn to neck just above roots.	Everything worn to neck just above roots.
80	Roots functioning in occlusal surface.	Roots functioning in occlusal surface.	Roots functioning in occlusal surface.

note: Adapted from Hall and German (1975) and Molnar (1971). All stages have a middle value such as 15, 35, 45, 55, 65, - only 25 and 75 are well-defined, the others are used when a tooth exhibits a wear pattern intermediate between two defined stages.

Appendix E

Burial Location Sketch Maps

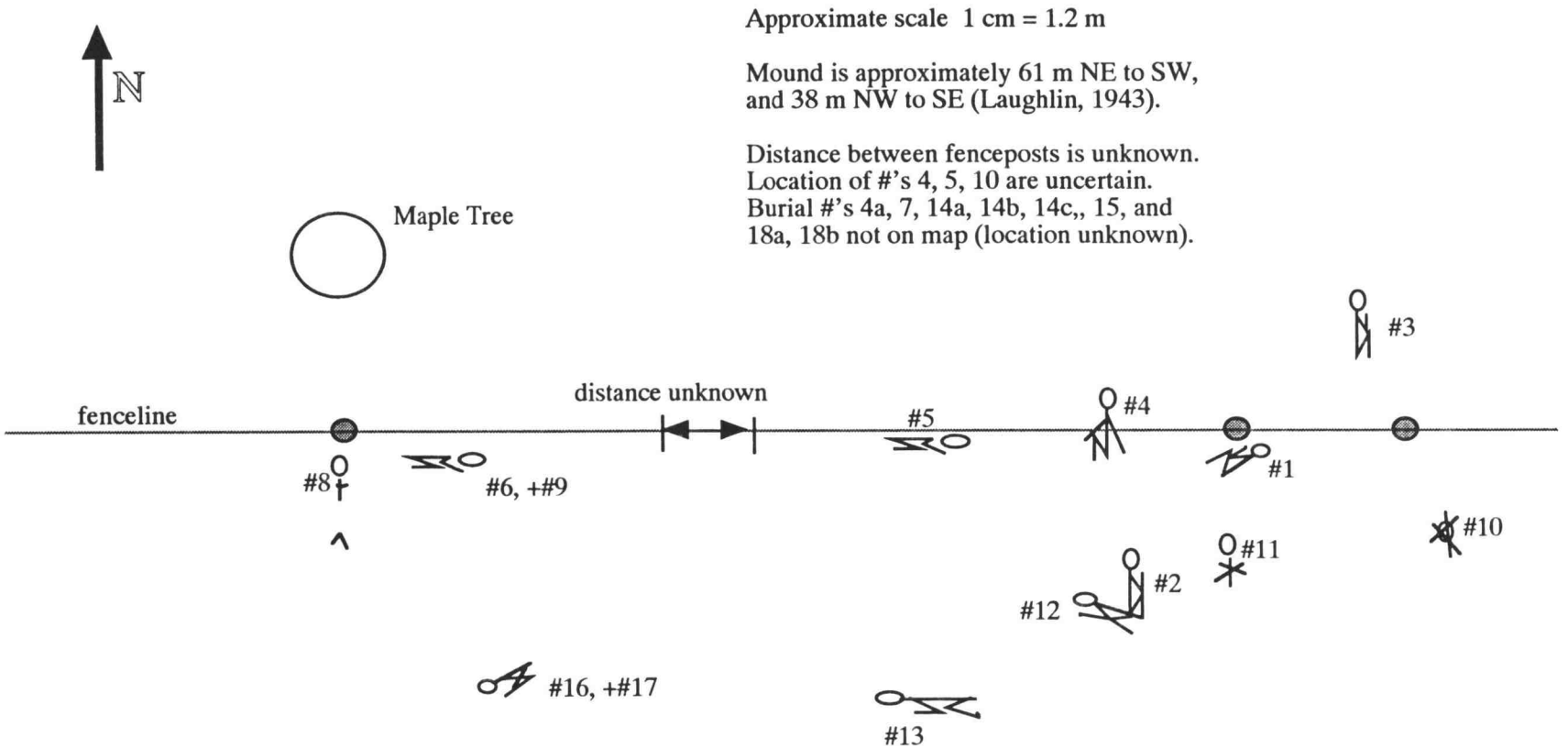

Figure 3. Fanning Mound Site Burial Locations, Re-Constructed From Field Notes of W.T. Edmundson

Not to scale

Mound is approximately 39 m N to S, and 24 m E to W (Laughlin, 1943).

Locations indeterminate for #7, 9, 10, 11, 14, 15, 41, xx, xy, xz.

It is uncertain how maps 1, 2, 3 fit together. They may overlay in whole or in part.

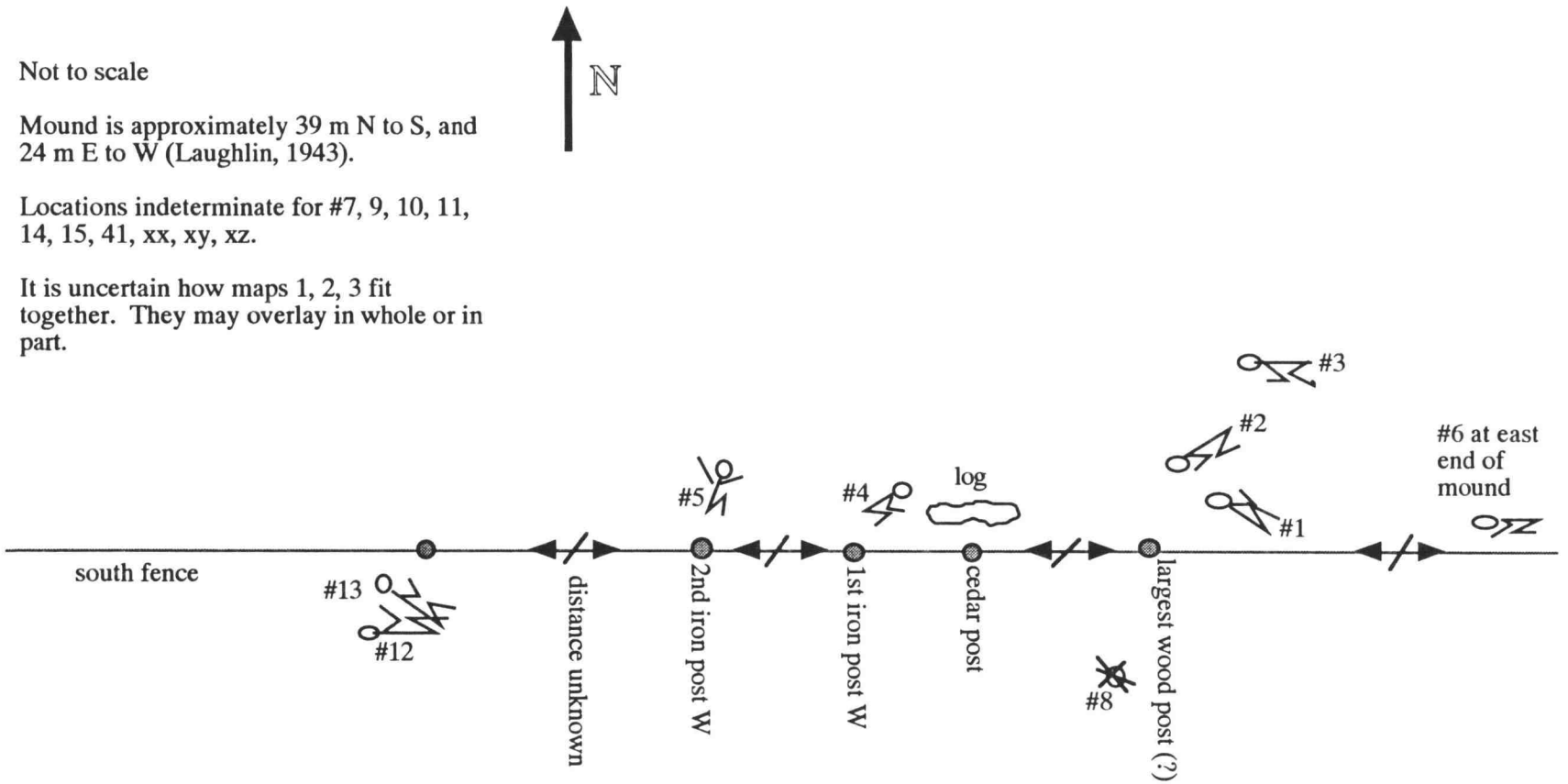

Figure 4. Fuller Mound Site Burial Locations, Re-Constructed From Field Notes of W.T. Edmundson - map 1of 3

1 cm is approx. 0.5 m

Mound is approximately 39 m N to S, and 24 m E to W (Laughlin, 1943).

Locations indeterminate for #7, 9, 10, 11, 14, 15, 41, xx, xy, xz.

It is uncertain how maps 1, 2, 3 fit together. They may overlay in whole or in part.

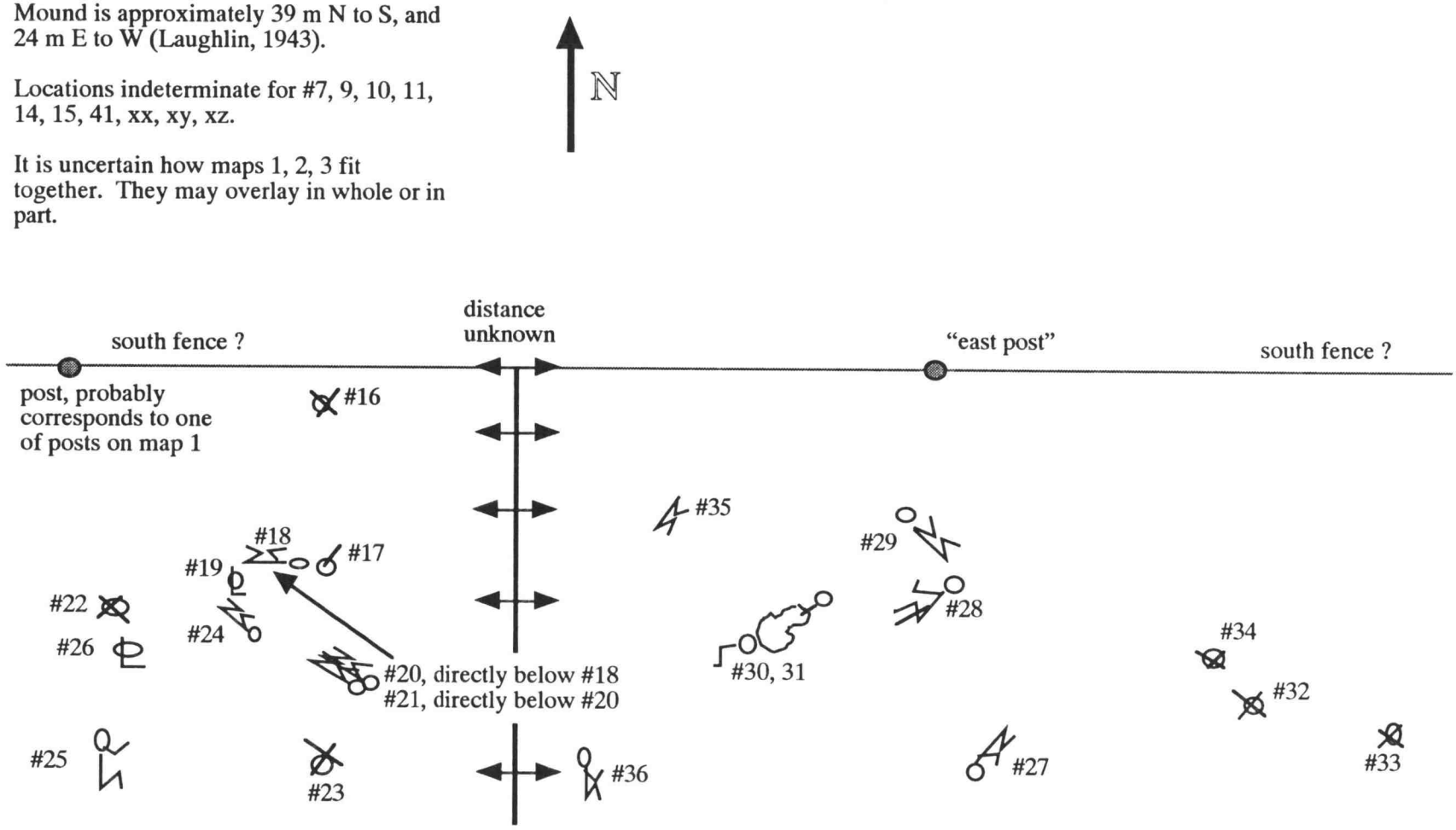

Figure 5. Fuller Mound Site Burial Locations, Re-Constructed From Field Notes of W.T. Edmundson - map 2of 3

1 cm is approx. 0.5 m

Mound is approximately 39 m N to S, and 24 m E to W (Laughlin, 1943).

Locations indeterminate for #7, 9, 10, 11, 14, 15, 41, xx, xy, xz.

It is uncertain how maps 1, 2, 3 fit together. They may overlay in whole or in part.

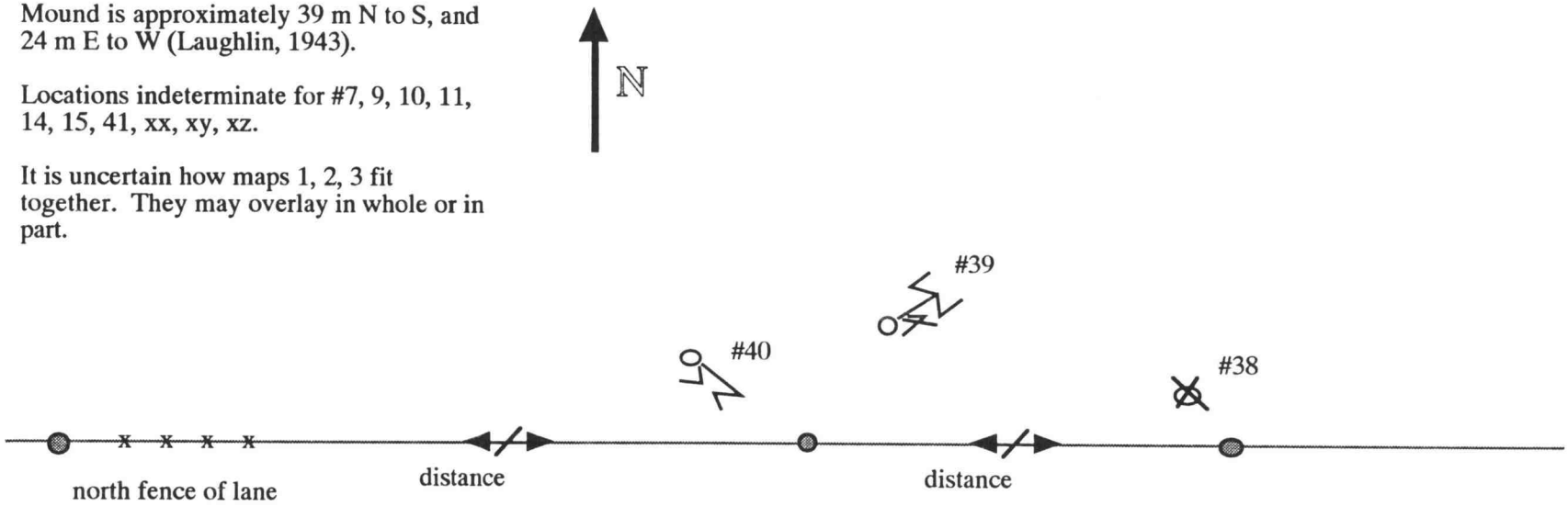

Figure 6. Fuller Mound Site Burial Locations, Re-Constructed From Field Notes of W.T. Edmundson - map 3 of 3